Evaluation of the Home Health Value-Based Purchasing (HHVBP) Model

Third Annual Report
Technical Appendices

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NOTICE
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Acronym List

Acronym	Term
ACH	Acute Care Hospitalization
ACO	Accountable Care Organization
ADL	Activities of Daily Living
AHRQ	Agency for Healthcare Research and Quality
AHRF	Area Health Resource File
AKI	Acute Kidney Injury
APM	Alternative Payment Model
AT	Achievement Threshold
BETOS	Berenson-Eggers Type of Service
BM	Benchmark
BPCI	Bundled Payment for Care Improvement
CBSA	Core-Based Statistical Area
CCI	Charlson Comorbidity Index
CCN	CMS Certification Number
CCS	Clinical Classifications Software
CCW	Chronic Conditions Data Warehouse
CI	Confidence Interval
CJR	Comprehensive Joint Replacement
CME	Common Medicare Environment
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare and Medicaid Services
CY	Calendar Year
D-in-D	Difference-in-Differences
DME	Durable Medical Equipment
ED	Emergency Department
ESRD	End-Stage Renal Disease
FFS	Fee-for-Service
FIPS	Federal Information Processing Standards
HCC	Hierarchical Condition Category
HCPCS	Healthcare Common Procedure Coding System
HH	Home Health
HHA	Home Health Agency
HHC	Home Health Compare
HHCAHPS	Home Health Consumer Assessment of Healthcare Providers and Systems
HHVBP	Home Health Value-Based Purchasing
HMO	Health Maintenance Organization
HUD	U.S. Department of Housing and Urban Development
ICD	International Classification of Diseases
IDR	Integrated Data Repository
LUPA	Low Utilization Payment Adjustment
MBSF	Master Beneficiary Summary File
MDD	Master Data Demonstration
MDM	Master Data Management
MDS	Minimum Data Set
MedPAR	Medicare Provider Analysis and Review
MS-DRG	Medicare Severity Diagnosis Related

Acronym	Term
MSSP	Medicare Shared Savings Program
NIH	National Institutes of Health
OASIS	Outcome and Assessment Information Set
OCM	Oncology Care Model
PAC	Post-acute Care Provider
PECOS	Provider Enrollment, Chain and Ownership System
PEP	Partial Episode Payment
POS	Provider of Services
QI	Quality Improvement
QIES	Quality Improvement and Evaluation System
RIF	Research Identifiable File
ROC	Resumption of Care
SNF	Skilled Nursing Facility
SOC	Start of Care
TA	Technical Assistance
TEP	Technical Expert Panel
TPS	Total Performance Score
UAF	Unified Analytic File
VRDC	Virtual Research Data Center

Appendix A: Quantitative Technical Appendix

This Technical Appendix provides details about the data sources and methods used to conduct the quantitative analyses for this Annual Report. Each of the following topics is covered below:

1. Detailed discussion of our quantitative analytic approach, including a discussion of the rationale and methods for defining the comparison group, our difference-in-differences framework, and results of parallel trend tests that informed the selection of our analytic approach (see **Section A.1, "Analytic Approach"**)
2. Detailed explanations of the descriptive variables and impact measures that are presented in the Annual Report, covering Quarter 1, 2013 through Quarter 4, 2018 (see **Section A.2, "Variable and Impact Measure Definitions"**)
3. Information about data acquisition and processing to create the analytic files that are necessary to define the impact measures of interest and conduct the analyses for this Annual Report (see **Section A.3, "Data Sources"**)
4. Step-by-step discussion of how we created the analytic file that we used to generate the results presented in this Annual Report (see **Section A.4, "Analytic File Creation"**)
5. Summary of the results of sensitivity analyses that explored additional covariate adjustments as part of our analytic approach (see **Section A.5, "Sensitivity Analyses"**)
6. Presentation of a Glossary (see **Section A.6, "Glossary"**)

A.1 Analytic Approach

We designed our quantitative analysis to address the question: What was the effect of the Home Health Value-Based Purchasing (HHVBP) Model on impact measures of interest such as health care utilization, quality of health care, health outcomes, and health care costs. From calendar year (CY) 2016 through CY 2022, home health agencies (HHAs) in Arizona, Florida, Iowa, Massachusetts, Maryland, Nebraska, North Carolina, Tennessee, and Washington are required to participate in the HHVBP Model. These states were selected at random from nine state regional groupings defined based on geographic location, utilization, demographics, and clinical characteristics, with each regional grouping containing five or six states.[1] To evaluate the impact of HHVBP by comparing the experience of beneficiaries and HHAs in HHVBP and non-HHVBP states, our empirical model had to address differing characteristics of beneficiaries and HHAs between HHVBP and non-HHVBP groups. Our analyses used data from multiple sources (described in Section A.3) to estimate impacts of HHVBP on the cumulative impact of HHVBP across the nine HHVBP states. Per direction from the Centers for Medicare and Medicaid Services (CMS), we focused on national level findings in this report. Most of the relevant data elements for this evaluation were available for both HHVBP and non-HHVBP groups and both before and after the start of the HHVBP Model (i.e., during both the evaluation baseline period from 2013-2015 and the post implementation period starting in 2016). This allowed for comparing outcomes between HHVBP and non-HHVBP beneficiary populations and assessing whether the relative outcomes for these two groups changed from before to after the start of the HHVBP Model.

Below, we describe the descriptive variables and impact measures used in this report. We then describe our overall analytic approach to construct a comparison group for the impact measures.

A.1.1 Descriptive Variables

An important step for this evaluation was to assess patterns and trends among HHVBP states in the characteristics of home health patients and HHAs and in the utilization of home health services. We compared descriptive measures in HHVBP and non-HHVBP states for individual years before and after implementation of the HHVBP Model. In multiple ways, these analyses informed the design of our analytic approach for evaluating effects of HHVBP. First, we used these analyses to assess the degree of balance between HHVBP states and all non-HHVBP states as a comparison prior to the implementation of the HHVBP Model. In addition, we used these analyses to identify any relevant trends that preceded implementation of HHVBP and any trends that coincided with the post-implementation period. The descriptive variables used for these analyses are defined below in Section A.2.1.

A.1.2 Impact Measures

We note two general reasons why outcomes may differ across HHVBP and non-HHVBP states: 1) differing observed characteristics of beneficiaries and HHAs studied; and 2) differing *un*observed characteristics of beneficiaries and HHAs. Our empirical strategies used information on observed characteristics to address differences between the treated populations (i.e., HHVBP states) and the comparison population (i.e., non-HHVBP states). Specifically, these strategies established a comparison

[1] HHS, CMS. (2015) 42 CFR 409, 424, 484. Medicare and Medicaid Programs; CY 2016 Home Health Prospective Payment System Rate Update; Home Health Value-Based Purchasing Model; and Home Health Quality Reporting Requirements; Final Rule. Federal Register 80 FR 68623. November 5, 2015. Accessed from here.

group to address observed differences and the use of a difference-in-differences (D-in-D) framework to address unobserved differences.

A.1.3 Conceptual Framework

The effectiveness of the HHVBP Model in achieving improved quality for beneficiaries served by HHAs depends on the extent to which it incentivizes HHAs to modify their operations and care delivery in ways that improve the quality of home health care and patient outcomes while controlling or reducing costs to Medicare. Our evaluation emphasizes the collection, analysis, and synthesis of information that is most relevant to how HHAs in the nine model states respond to the HHVBP Model, in comparison to equivalent non-model HHAs throughout the same time period. By using observations of HHAs and the beneficiaries for whom they provide care in non-model states, we attempted to answer the question: What would have occurred in these agencies and for their beneficiaries if the HHVBP Model had not been implemented? Our analyses examined whether the HHVBP Model is achieving its overarching goal—to improve the quality of home health services and efficiency of care—and identify any potential unintended consequences.

The conceptual framework in Exhibit A-1 highlights key pathways for change under the HHVBP Model. This framework informed our approach to addressing the evaluation research questions presented in Section 1 of the Third Annual Report. The HHVBP Model's financial incentives aim to incentivize agencies to take steps to improve their performance or otherwise maintain high levels of performance on the measures that determine their total performance scores (TPS). The TPS results for each HHA and their corresponding (and growing) changes in Medicare payments may in turn influence their future behavior. The design of the model encourages agencies to review their performance and make adjustments in response to them. This may include subsequent changes in agency operations designed to raise or bolster performance in certain areas. Additionally, HHVBP payment adjustments may influence agency decisions regarding market entry/exit or perhaps consolidation.

The response of agencies to HHVBP may have implications for the manner in which they arrange for and deliver home health services, which may in turn result in detectable changes in claims and Outcome and Assessment Information Set (OASIS) data for the use of home health services and corresponding Medicare expenditures. Examples of HHA responses to HHVBP may include changes to the frequency, timing, types of visits, or processes of care during home health episodes or the extent to which agencies seek recertification for an additional episode to meet patient needs. HHAs may target changes in services to patients in specific diagnosis categories if they perceive greater potential gains through doing so. In addition to potentially reflecting changes in practice pattern, changes in the delivery of home health services could also have implications for other forms of utilization. For instance, if the quality of care provided by agencies improves, this may reduce the need for utilization of certain resource-intensive services such as avoidable hospitalizations, emergency department (ED) visits, or transfer to a skilled nursing facility (SNF).

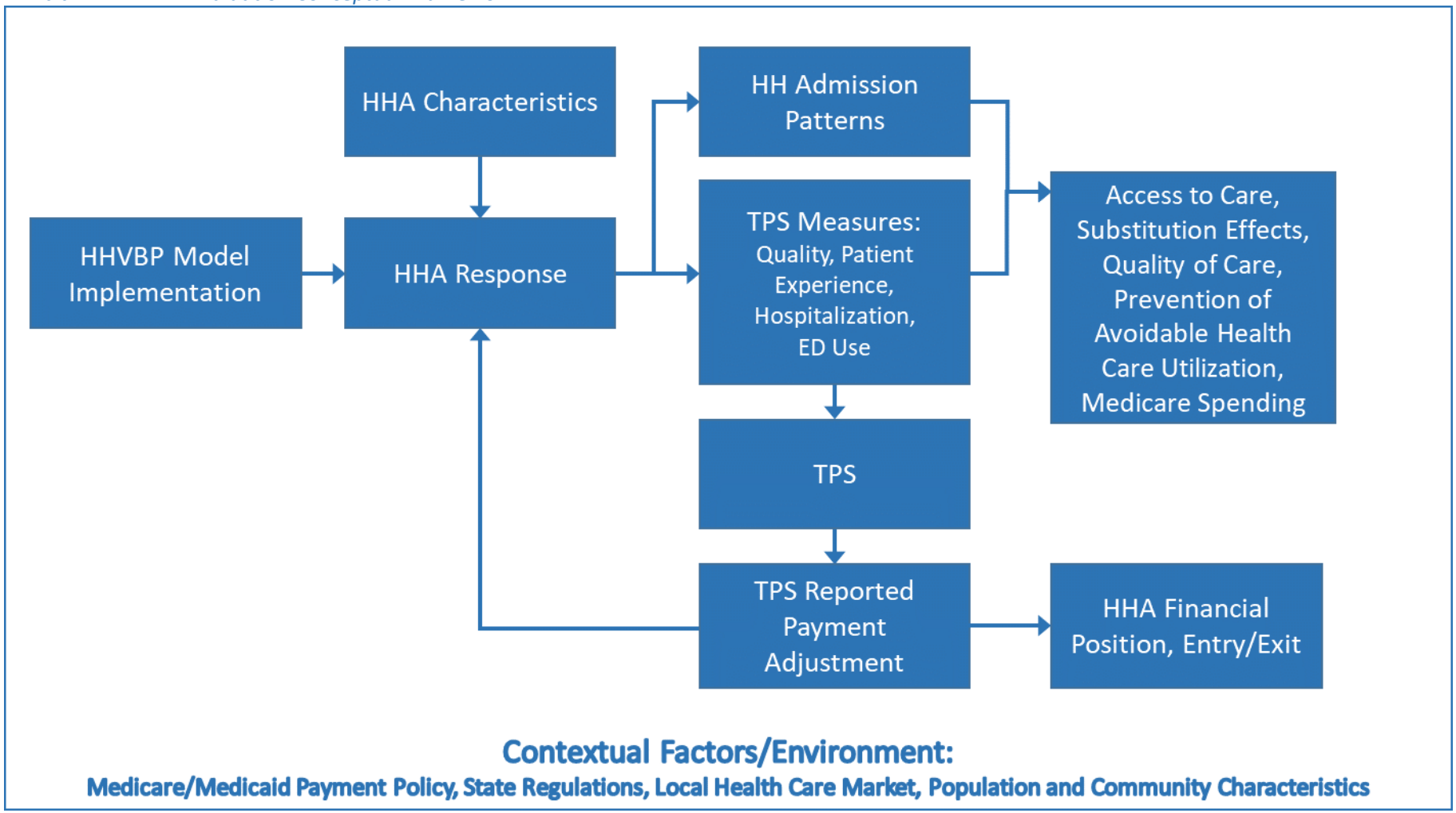
Importantly, we expected to observe variation between agencies and between geographic areas in the impact of the model. HHAs will respond differently to the HHVBP Model depending on their individual circumstances. For example, agencies may differ in their perceptions of the financial risks and opportunities related to HHVBP and their readiness to adopt new processes that are designed to improve performance. Some types of agencies may have more limited experience and/or resources to successfully undertake quality improvement initiatives. Depending on factors such as the organizational

characteristics of these agencies, their characteristics of geographic location and markets, and the types of populations they serve, the HHVBP Model may have a differential impact on certain beneficiary subgroups who tend to receive services from these agencies. This evaluation sheds light on what circumstances are associated with this variation and if there are any areas of concern.

As reflected in Exhibit A-1, the incentives introduced under the HHVBP Model could potentially lead HHAs to make changes in their admission patterns and how they treat particular types of patients. For example, HHAs might avoid initiating episodes for beneficiaries for whom higher quality outcomes in the home health setting may be difficult to achieve. This different profile of patient needs may result in changes in the volume or mix of services used by beneficiaries, which, in turn, may result in changes in overall Medicare expenditures. Thus, it is important to disentangle to what extent changes in observed practice patterns are associated with treating patients differently, such as changing the types of services provided to a particular patient, versus treating different patients (for example by admitting patients with a more favorable case mix).

As noted above, our focus in this report is to understand any initial effects of HHVBP during CYs 2016 through 2018. The most pertinent aspects of the evaluation framework (Exhibit A-1) for this report include the initial response of agencies to the introduction of the reporting phase of the performance incentives, the early phase of payment adjustments to agencies, as well as effects of the model on agency performance observed through measures that comprise the TPS score. Furthermore, we examined if there were any changes observed in the indicators of quality and Medicare spending for home health services. In later years of the evaluation, as the HHVBP Model progresses, we will explore other pathways for change under the model as depicted in Exhibit A-1.

Exhibit A-1. HHVBP Evaluation Conceptual Framework



A.1.3.1 Difference-in-Differences Approach for Impact Measures

We used a D-in-D framework to compare changes in impact measures observed over time in the HHVBP states relative to those in non-HHVBP states as the basis for evaluating the effects of HHVBP. The D-in-D framework offers a quasi-experimental design that can address many threats to validity, and rests on the critical assumption that, in the absence of the HHVBP Model, the impact measures in the two groups would have changed in a parallel manner over time. Our D-in-D analysis compared changes in impact measures observed over time in the HHVBP states combined to corresponding changes in the comparison group. The basic D-in-D estimate was defined as the difference in an outcome of interest over time in the model states, after subtracting the difference, over time, in the comparison group:

$$D\text{-}in\text{-}D = [Y_{INT,POST} - Y_{INT,PRE}] - [Y_{COMP,POST} - Y_{COMP,PRE}]$$

where $Y_{INT,POST}$ and $Y_{INT,PRE}$ are the post- and pre-intervention outcome levels, respectively, for the HHVBP group, and $Y_{COMP,POST}$ and $Y_{COMP,PRE}$ are the post- and pre-intervention outcome levels, respectively, for the comparison group.

With this model specification, the impact estimate is the differential change in an outcome for the HHVBP states between the baseline and follow-up period(s), relative to that same change for the comparison group. That is, the differential change in the outcome over time for the HHVBP states relative to non-HHVBP states represents the estimated effect of HHVBP. The D-in-D design controls for unobserved, time-varying changes that are common to all beneficiaries (i.e., cyclical or seasonal trends or broader changes in the health system) as well as time-invariant, unmeasured differences between HHVBP and comparison states' markets and beneficiary populations. Moreover, through the use of a multivariate regression, we were able to adjust for observed characteristics of beneficiaries influencing the outcome. We also included state fixed effects to account for time-invariant, unobserved differences across states that may correlate with outcomes and with HHVBP participation.

For most of the impact measures of interest for this Annual Report, we used a D-in-D approach to estimate effects of the model for all HHVBP states combined.[2] We implemented this approach in a consistent multivariate linear regression framework for a broad range of impact measures of interest for this evaluation. We provide details regarding the specification of D-in-D models below in Section A.1.5.

A.1.4 Construction of the Comparison Group

A.1.4.1 Background

We continued to use the unified comparison group methodology that we employed in our Second Annual Report. Balancing the HHVBP and comparison groups on factors that impact our outcomes of interest is important to reduce observed differences in the two populations that could lead us to incorrectly infer an effect of HHVBP that is actually a result of differences in the underlying populations. However, there are numerous and diverse impact measures of interest for this evaluation that correspond to different populations (e.g., Medicare fee-for-service [FFS] beneficiaries who receive home health care, all home health patients with Medicare or Medicaid coverage, HHAs) with different underlying factors that affect the outcome. In addition, broader changes are occurring in the home

[2] We were unable to use a D-in-D approach for the three measures that are self-reported by HHAs via the Secure Web Portal since these data are only available for HHAs in the HHVBP states. As such, we instead focused on reporting rates among HHAs in the nine HHVBP states.

health landscape that could have varying implications for each of the impact measures. Together, these factors posed considerable challenges in developing a unified comparison group approach that would achieve balance for *all* impact measures of interest.

Therefore, we used the same approach for this report as was used in the Second Annual Report: a unified comparison group approach that focused balancing efforts on a subset of key impact measures that encompass important aspects of home health quality of care, utilization of services, and Medicare spending that reflect a range of home health populations relevant to the HHVBP measure set. This strategy allowed us to prioritize among the multiple impact measures of interest in designing our analytic approach (Exhibit A-2).

Exhibit A-2. Key Impact Measures Used to Inform Comparison Group Approach

Measure	Underlying Population
Quality	
Unplanned Acute Care Hospitalization/First FFS Home Health (HH) Episodes	FFS Beneficiaries who Received HH Care
ED Use (no Hospitalization) among First HH Episodes	FFS Beneficiaries who Received HH Care
Improvement in Ambulation-Locomotion	Medicare and/or Medicaid Beneficiaries (including Managed Care Enrollees)
Discharged to Community	Medicare and/or Medicaid Beneficiaries (including Managed Care Enrollees)
Spending	
Average Medicare Spending per Day during FFS HH Episodes of Care	FFS Beneficiaries who Received HH Care
Average Medicare Spending per Day following FFS HH Episodes of Care	FFS Beneficiaries who Received HH Care
Average Medicare Spending per Day during and following FFS HH Episodes of Care	FFS Beneficiaries who Received HH Care
Average Medicare Spending per Day for Unplanned Acute Care Hospitalizations among FFS HH Beneficiaries	FFS Beneficiaries who Received HH Care
Total Performance Score (TPS)	**Home Health Agencies**

HHVBP Measures indicated by italic text.

Motivation for Selection of Key Measures to Inform the Comparison Group Approach

The two Medicare claims-based HHVBP measures—Unplanned Hospitalization and ED Use among First Home Health Episodes—correspond to measures of quality that were both directly incentivized by the model and could be indicators of the quality of home health care. These measures reflect aspects of utilization that HHVBP aims to reduce, where appropriate, as a potential means for improving quality while achieving lower average Medicare expenditures among home health beneficiaries.

We also included two OASIS-based HHVBP measures that cover a broader population than the claims-based HHVBP measures and represent different aspects of quality that are incentivized under HHVBP. The use of the Improvement in Ambulation-Locomotion measure—an indicator of Activities of Daily Living (ADL)—ensured that the comparison group design accounted for functional outcome improvement. This measure is National Quality Forum-endorsed and was among the six OASIS outcome improvement measures in the HHVBP Model for CY 2017. The Improvement in Ambulation-Locomotion measure is among the more broadly applicable measures, based on the subset of home health patients

for whom it is used. In addition, the Improvement in Ambulation-Locomotion measure represents one of the functional outcome improvement measures identified by a previous Technical Expert Panel (TEP) as being especially relevant in helping patients be able to stay at home (along with Improvement in Toilet Transferring and Improvement in Bed Transferring).[3] The other OASIS-based measure that we chose to include as a key measure in our comparison group approach—Discharged to Community—identifies successful discharges to remain at home or to self-care. The OASIS items used to define this measure are related to the type of assessment and are less likely to be manipulated than other OASIS-based measures.[4]

The three measures of average daily Medicare spending are important as they can inform conclusions about the impact of HHVBP on Medicare spending for beneficiaries across a wide range of services both during and following episodes of home health care. We also included an aspect of spending that relates more directly to incentives under the model—spending for unplanned acute care hospitalizations (ACH)—which may be a key contributor to any overall changes in spending that result from the HHVBP Model.

Together, these nine key impact measures served in 2018 as our basis for developing a simplified, more unified comparison group approach for this evaluation, which we also used in this year's report. As discussed below, the methodology we employed to establish a valid comparison group for these measures was then applied to other outcomes of interest, while also allowing for a degree of flexibility where supported by a theory and empirical evidence.

A.1.4.2 Comparison Group

We designed the quantitative analyses for this report to evaluate the effect of the HHVBP Model on a range of impact measures that included Medicare spending, utilization of services, quality of care, and patient experience. As discussed above, we prioritized a subset of impact measures in the design of our overall approach, which we then extended to other impact measures of interest. To facilitate the interpretation of findings across measures, we established a common comparison group approach for our analyses. These analyses involved comparisons for both beneficiaries and agencies between HHVBP and non-HHVBP states.

As important aspects of the design of the HHVBP Model, the randomized selection of nine HHVBP states and mandatory participation of all HHAs in these selected states helped to guard against selection bias. As reflected in the results of our descriptive analyses (see Section C.1 in the Appendix of Supplemental Tables and Results), we found that the model design achieved reasonably close balance between HHVBP states and the remaining states in many beneficiary and agency characteristics, and aspects of home health care. Given the extent of diversity in beneficiary and agency characteristics and treatment

[3] In November 2018, the Final Rule for CY 2019 finalized that the Improvement to Ambulation-Locomotion measure (as well as the Improvement in Bed Transferring and Improvement in Bathing measures) would be replaced in the HHVBP measures set with two composite measures of ADL beginning with performance year 4 (i.e., CY 2019) of the HHVBP Model. See 2018 Final Rule here.

[4] For example, the two OASIS items used in constructing the measure are not as subjective as other OASIS-based measures. First, Reason for Assessment (M0100) must indicate that the assessment is a discharge assessment and not a transfer to an inpatient facility, or death at home, and differing items are to be collected. Second, Discharge Disposition (M2420) is used and indicates that the individual remained in the community after discharge, either with or without formal assistance.

patterns across states, not all factors were balanced between the two groups through randomization alone, with a degree of imbalance observed for certain factors.

Given the design attributes of randomization and mandatory participation and the degree of balance observed for a range of factors, we defined a single comparison population consisting of beneficiaries and agencies in the 41 states not selected for participation in the HHVBP Model.[5] We used a multivariate linear regression approach to compare observations in the nine HHVBP states with those in the 41 comparison states while adjusting for a common set of covariates across measures to the extent possible. In the context of a parametric regression framework, we controlled for observed differences between the HHVBP and comparison groups, generated a D-in-D estimator, and examined adjusted baseline differences for consideration of the estimator's key parallel trend assumption.

To address the various research questions of interest for this evaluation given the goals of the HHVBP Model and the incentives reflected in the HHVBP performance measures, we used this analytic approach and single comparison group to examine a range of impact measures for this report. These impact measures are enumerated below in Exhibit A-3.

[5] The evaluation restricts comparisons to the 41 non-HHVBP states and excludes the District of Columbia and U.S. territories, as they were not eligible for selection into the HHVBP Model.

Exhibit A-3. Impact Measures Used to Evaluate HHVBP

Measure	Unit of Analysis	Baseline Period
FFS Claims-Based Quality Measures		
ED Use (no Hospitalization)/First FFS HH Episodes	FFS Episode-Level	2013-2015
Unplanned Acute Care Hospitalization/First FFS HH Episodes	FFS Episode-Level	2013-2015
Unplanned *Acute Care Hospitalization*/All FFS HH Episodes	FFS Episode-Level	2013-2015
Unplanned Hospital Readmission in the First 30 days of HH Care	FFS Episode-Level	2013-2015
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	FFS Episode-Level	2013-2015
Skilled Nursing Facility (SNF) Use/All FFS HH Episodes	FFS Episode-Level	2013-2015
FFS Claims-Based Spending Measures		
Average Medicare Spending per Day for Unplanned Acute Care Hospitalizations Among all FFS HH Episodes	FFS Episode-Level	2013-2015
Average Medicare Spending per Day during and following FFS HH Episodes of Care	FFS Episode-Level	2013-2015
Average Medicare Spending per Day during FFS HH Episodes of Care	FFS Episode-Level	2013-2015
Average Medicare Spending per Day following FFS HH Episodes of Care	FFS Episode-Level	2013-2015
OASIS-Based Outcome Measures		
Discharged to Community	OASIS Episode-Level	2013-2015
Improvement in Ambulation-Locomotion	OASIS Episode-Level	2013-2015
Improvement in Bathing	OASIS Episode-Level	2013-2015
Improvement in Bed Transferring	OASIS Episode-Level	2013-2015
Improvement in Dyspnea	OASIS Episode-Level	2013-2015
Improvement in Management of Oral Medications	OASIS Episode-Level	2013-2015
Improvement in Pain Interfering with Activity	OASIS Episode-Level	2013-2015
Improvement in Status of Surgical Wounds	OASIS Episode-Level	2013-2015
OASIS-Based Process Measures		
Influenza Immunization Received for Current Flu Season	HHA-Level	2013-2015
Pneumococcal Polysaccharide Vaccine Ever Received	HHA-Level	2013-2015
Depression Assessment Conducted	HHA-Level	2013-2015
Diabetic Foot Care and Patient/Caregiver Education Implemented during All Episodes of Care	HHA-Level	2013-2015
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	HHA-Level	2013-2015
Timely Initiation of Care	HHA-Level	2013-2015
HHCAHPS-Based Patient Experience Measures		
How often the home health team gave care in a professional way	HHA-Level	2013-2015
How well did the home health team communicate with patients	HHA-Level	2013-2015
Did the home health team discuss medicines, pain, and home safety with patients	HHA-Level	2013-2015
How do patients rate the overall care from the HHA	HHA-Level	2013-2015
Would patients recommend the HHA to friends and family	HHA-Level	2013-2015
HHA TPS	HHA-Level	2015*

*HHVBP Measures indicated by italic text. | * As discussed in this report, a D-in-D approach is not used for analysis of agency TPS. In calculating the TPS, the baseline period for measuring achievement on HHVBP performance measures is 2015. The baseline period for measuring agency improvement on individual measures is the earliest of 2015 or their first full year in operation.*
The duration of OASIS episodes of care may differ from that of Medicare FFS episodes.
Note: We do not include the three new HHA-reported measures (Influenza Vaccination Coverage for HHA Personnel; Herpes Zoster [shingles] Vaccination for Patient; Advance Care Plan) since these data are only available for HHAs in the HHVBP states.

A key step in designing our regression-based comparison group approach was to select factors for covariate adjustment. We considered a combination of several criteria in selecting factors for inclusion in the regression analyses. While not every factor that was chosen was equally preferred based on each criterion, each factor that was chosen was seen as having advantages for inclusion when balancing among these various criteria and in achieving unbiased estimates of the effects of HHVBP. Below we describe the criteria used in selecting potential factors for covariate adjustment:

- ***Adoption of a uniform analytic approach.*** To the extent possible, we sought to adjust for similar factors in examining the range of impact measures that are of interest for this evaluation. We used this strategy to facilitate interpretation of the estimated effects of HHVBP across numerous impact measures.
- ***Availability of data across multiple populations of interest.*** In particular, while data reported in OASIS were reported for all home health patients with Medicare or Medicaid coverage, there was other information that could be obtained only from Medicare claims or other CMS data sources for Medicare FFS beneficiaries and were therefore not available for analysis of OASIS-based impact measures. In seeking a relatively uniform analytic approach, we therefore sought to limit the selection of factors available for Medicare FFS beneficiaries only unless there was a compelling rationale based on other criteria.
- ***Degree of imbalance between HHVBP and non-HHVBP states.*** As a result of the randomized selection of states for participation in the HHVBP Model, there were many similarities between HHVBP and non-HHVBP states during the baseline period. However, there were larger differences between the two groups in certain beneficiary and agency characteristics. We described baseline differences in such factors in the report (e.g., patient race/ethnicity and rural location) and included them as covariates to achieve balance.
- ***Relationship with impact measures of interest for this evaluation.*** Factors found to have a relatively strong relationship with certain impact measures and/or to have a relationship with multiple impact measures of interest were given greater emphasis, provided they also satisfied other criteria.
- ***Differential trends in HHVBP and non-HHVBP states prior to the implementation of the HHVBP Model.*** Factors exhibiting such trends may be both exogenous to the HHVBP Model and pose a greater risk of introducing bias should their baseline trends extend into the post-HHVBP period. The extent of this risk also depended on other criteria, such as the strength of their relationship with the impact measures. Adjustment for such factors may help to satisfy the parallel trends assumption of our D-in-D approach.
- ***Potential endogeneity.*** We sought to avoid selection of factors that were endogenous to the HHVBP Model. For example, adjustment for clinical characteristics of patients influenced by the quality of prior home health care may lead to biased estimates of the effects of HHVBP. To minimize this risk, we used caution in selecting factors that changed differentially for HHVBP and non-HHVBP states between the pre-implementation and post-implementation periods, unless such differential trends were evident during the pre-implementation period and it was supported by other criteria.
- ***Degree of subjectivity in measurement.*** We also sought to avoid factors reported by agencies perceived as being subjective measures of patient status and are therefore more susceptible to changes over time in reporting. We note that in certain instances, other considerations such as the strength of the relationship with patient outcomes were given precedence. This was

relevant when considering the initial status corresponding to each of the OASIS outcome improvement measures (e.g., improvement in ambulation), where there is often a degree of subjectivity in determining the patient's initial status.

- ***Correlation with other factors being considered for covariate adjustment.*** We did not select factors strongly correlated with other factors that were preferred as covariates based on other criteria.

The process of selecting covariates based on these criteria resulted in (a) a core set of covariates that were used for analyses of a broad range of impact measures and (b) the inclusion of a relatively small number of additional covariates for the analysis of either a particular impact measure or of a related group of impact measures. In the following sections, we describe both the core set of factors that were used for covariate adjustment as part of our standard model specification (listed below in Exhibit A-4) and the additional covariates or other refinements that apply to a subset of impact measures.

Exhibit A-4. Core Set of Factors for Covariate Adjustment

Beneficiary Characteristics
Age
<65 years
65 – 84 years
85 years and older
% Female
Race/Ethnicity (Mutually Exclusive)
Hispanic (regardless of black/white/other race)
Non-Hispanic Black
Non-Hispanic White
Non-Hispanic Other
Non-Hispanic Multiracial
% Dual eligible
% Rural
% of Persons in the Patient's County of Residence who are Ages 25 years and Older with Less than a High School Diploma
Alignment with selected APMs
BPCI-Model 2
BPCI-Model 3
BPCI Advanced
MSSP
Next Generation ACO
Pioneer ACO

Agency Characteristics
Ownership
For-profit
Non-profit
Government-owned
Setting
Hospital-based
Freestanding
Chain affiliation
Yes
No
Unknown
HHA Age
<4 years
4-10 years
>10 years
Agency Size: Number of OASIS episodes
1-59
60-249
250-499
500-999
1000+

Core Clinical Indicators Used for Episode-Level Impact Measures*
Ambulation and Locomotion
Able to independently walk with the use of a one-handed device
Requires two handed device for level ground or human assistance for stairs and uneven ground
Walks only with supervision or assistance from another at all times
Chairfast to bedfast
Interaction of HHVBP (treatment) indicator with each of the four levels of Ambulation and Locomotion
Receiving psychiatric nursing services
Risk for Hospitalization
Multiple hospitalizations in past 6 months
History of falls
Currently taking 5 or more medications
Non-surgical wound or skin lesion
Surgical Wound
Requires oxygen therapy
Requires urinary catheter
Discharged from Inpatient Facility in last 14 Days
Orthopedic diagnosis
Pressure Ulcer
Pressure Ulcer Stage 2
Pressure Ulcer Stage 3
Pressure Ulcer Stage 4
Pressure Ulcer Not Stageable
Neoplasm Diagnosis

**Derived from OASIS assessment at start of home health care.*

As noted above, this core list of model covariates was, in certain instances, augmented or otherwise refined for analyses of specific impact measures. In each case, the criteria described above were used in determining whether there was a rationale for inclusion or exclusion of specific covariates. However, these additional covariates were not included among the core list of covariates either because they were obtained from a data source that was not available for the entire population of interest, the rationale for inclusion only applied to a subset of impact measures, or for other reasons given below.

For claims-based impact measures, we also included adjustments for end-stage renal disease (ESRD) or disability as the reason for Medicare entitlement, for which comparable information was not available for non-Medicare patients. These factors were specified as additional covariates based on the strength of their relationship with a range of claims-based impact measures and inexact balance between HHVBP and non-HHVBP groups.

For OASIS episode-level impact measures, we added an adjustment for Medicaid coverage among patients who were not reported as being dually eligible for Medicare and Medicaid. This covariate was not applicable for analysis of claims-based impact measures, which are limited to Medicare FFS beneficiaries.

For each of the seven OASIS-based outcome improvement measures, which were used to assess improvement over time in patient functioning or other clinical characteristics, we adjusted for outcome-specific start of care indicators of patient status. More specifically, we adjusted for the indicator of a patient's status from the initial OASIS assessment corresponding to the OASIS outcome of interest being examined. In selecting these relevant initial status indicators as covariates, we considered multiple factors. First, in our analyses of each of these measures, we found a relatively strong positive relationship of greater initial impairment or severity with greater improvement over time in patient status (i.e., such that there was greater opportunity for improvement). In addition, for many of these measures, there was a notable trend towards higher levels of impairment being reported at initial assessment that began during the pre-implementation period. These pre-implementation trends may have reflected agency efforts to increase accuracy in coding in response to public reporting initiatives. Given these considerations, we determined that inclusion of these outcome-specific covariates would allow us to avoid omitted variable bias related to the patient's initial status reported in OASIS.

Additionally, we included an interaction term between the outcome-specific start of care variables and the HHVBP (i.e., treatment) indicator to account for any differences in coding of patient status at the start of care between HHVBP and non-HHVBP states. For example, when modeling improvement in bathing, we adjusted for the initial level of impairment in bathing and also interacted indicators of the level of impairment in bathing with the HHVBP indicator. We used a similar approach in analyzing each of the other OASIS-based improvement measures.

Adjustment for Alternative Payment Models

Other CMS initiatives and alternative payment models (APMs) have potential to impact HHA operations and beneficiaries' use of home health services. This year we had access to secondary data sources for a number of APMs that enabled us to investigate their potential impact and how best to account for such external factors in our analyses. The relevant APMs that were active during 2013-2018 and for which we had data available were: the Bundled Payment for Care Improvement (BPCI) Initiative and Accountable Care Organization (ACO)-centered models, including the Medicare Shared Savings Program, the Pioneer ACO model, and the Next Generation ACO model.

As a refinement to our approach for this report, to account for these initiatives which may affect HHA performance under HHVBP, we adjusted for whether a beneficiary was aligned to any of these APMs at any time during their home health episode. Home health beneficiaries participating in APMs may have a different course of care than home health beneficiaries not aligned with APMs. For example, under the voluntary BPCI, participating acute care hospitals and post-acute care providers receive bundled payments for services rendered during a defined episode of care, such that these providers are incentivized to contain costs and improve the quality of care. Similarly, since the enactment of the Affordable Care Act, CMS has established a number of ACO-APMs tasked with improving coordination and quality of patient care, often under a dual-sided financial risk- and reward-based agreement with CMS. To avoid possible bias related to any effects of APMs on our impact measures of interest, we additionally controlled for beneficiary alignment to APMs in our D-in-D regression model. Information on APMs was only available for FFS claims-based episodes. Additional information on each of the APMs used in our covariate list are outlined in Section A.3.12 below. As data become available, we plan to adjust for other relevant APMs in future reports, including the Comprehensive Joint Replacement (CJR) Model and Oncology Care Model (OCM).

State Fixed Effects

In general, given the random selection of the states into the HHVBP model, the D-in-D approach (as described above) helps to control for unobserved time-invariant heterogeneity in the treatment model. However, to control for residual time-invariant confounding and to limit selection bias in the estimation of causal effects, we adjusted for a full set of state fixed effects in the D-in-D model specification. By exploiting within-group variation over time, fixed effects regression is a powerful tool for reducing concerns that omitted variables drive any associations between dependent and independent variables.

Covariate Refinements

We examined three distinct sets of HHA-level impact measures: agency TPS, OASIS-derived process measures, and Home Health Consumer Assessment of Healthcare Providers and Systems (HHCAHPS)-derived measures. For analyses of these measures, we included all of the core beneficiary characteristics (aggregated to the agency level) and agency characteristics listed in Exhibit A-4 as covariates, with a few exceptions. For HHCAHPS measures, we excluded patient age and area education variables since comparable factors were already accounted for in the risk adjusted HHCAHPS measure values. Additionally, we did not specify OASIS episode characteristics (aggregated to the agency level) as covariates for analyses of the HHA-level impact measures, given that each of these measure values already reflected risk adjustment based on any clinical factors that were deemed relevant to measuring agency performance under HHVBP.

Further details regarding how individual covariates were defined for inclusion in regression analyses are provided in Section A.2.1.

New in this report, we also analyze impact measures at the state level. Section A.1.6 below discusses how we constructed the comparison group for each of the nine HHVBP states.

A.1.5 Difference-in-Differences Model

With a baseline period for analysis of 2013-2015, we used a D-in-D model to estimate yearly average treatment effects separately for the three post-implementation years, 2016, 2017 and 2018. We also estimated a cumulative average effect over all three years (2016-2018).

A.1.5.1 Yearly Difference-in-Differences Estimator

To obtain individual yearly effects in the post-implementation period, we restricted the estimation sample to include observations through the year of interest (i.e., year = 1, 2, 3 for 2016, 2017 and 2018 respectively). That is, we included data through 2016 in the model used to obtain D-in-D estimates for 2016, and included data through 2017 in the model used to obtain the D-in-D estimates for 2017, and included data through 2018 in the model used to obtain the D-in-D estimates for 2018.

Defining each episode *i* in time *t*, identifying the treatment episodes with an indicator variable $Treat_i$, identifying the post-implementation year variables *t* with an indicator variable $I(t = t_k)$, and identifying a vector of covariates as $\mathbf{P}_{Cov}$ (defined in Section A.1.4), the D-in-D estimator for outcome *Y* is implemented as:

$$Y_{i,t} = \alpha_0 + \alpha_1 Treat_i + \sum_{k=1}^{k=3} \beta_k I(t = t_k) + \sum_{k=1}^{k=3} \delta_k Treat_i * I(t = t_k) + \sum_{j=1}^{j=3} \rho_j I(q = j) + \omega \mathrm{P}_{Cov} + \sum_{s=3}^{s=50} \theta_s I(S = s) + \epsilon_{i,q,t}$$

Where *k* = 1 for year 2016, *k* =2 for year 2017 and *k* = 3 for year 2018

- $Treat_i$: 1, 0 indicator (1= HHVBP states, 0= Non-HHVBP states)
- $I(t = t_1)$: 1 , 0 indicator (1 when year = 2016, 0 otherwise)
- $I(t = t_2)$: 1 , 0 indicator (1 when year = 2017, 0 otherwise)
- $I(t = t_3)$: 1 , 0 indicator (1 when year = 2018, 0 otherwise)
- α_0 is an intercept
- α_1 is the average difference between the HHVBP and comparison populations over the pre-implementation period
- β_k is the average change from pre- to post-implementation for the HHVBP population, where *k* = 1 for year 2016, *k* = 2 for year 2017, and *k* = 3 for year 2018
- δ_k is the yearly D-in-D effect, for *k* = 1, 2, 3; the difference in the change from pre-implementation to post-implementation for the HHVBP population relative to the comparison population (i.e., to estimate the treatment effect of HHVBP)
- ρ_j coefficients capture seasonal effects associated with the four quarters of the year, where *j* = 1, 2, 3 (one quarter omitted as reference)
- ω is a vector of coefficients associated with vector of covariates $\mathbf{P}_{Cov}$
- $I(S = s)$: 1, 0 indicator (1 when from state *s*, 0 otherwise); two states omitted as reference since "treat" is also included in the model
- θ_s coefficients are fixed effects for each state *s*
- $\epsilon_{i,q,t}$ episode-specific error term.

In the regression equation, we included three estimates (ρ_1, ρ_2, ρ_3) capturing quarterly effects since we included a constant in the equation. Each episode was given an equal weight except for the four average Medicare spending per day measures, which were appropriately weighted by the number of days included in the denominator (see Section A.2.2). In order to obtain the average annual (cumulative) impact estimate over the three HHVBP Model years (i.e. 2016 – 2018), we calculated a linear

combination of the three year-specific impact estimates with each year's impact weighted by the number of HHVBP episodes in that year, or in the case of the spending measures, weighted by the sum of denominator days in HHVBP states for the year.

Standard errors were clustered at the agency-level. Implementation of HHVBP directly impacts HHAs. Since home health episodes within the same agency are correlated, accounting for agency clusters protects against the potential underestimation of standard errors, thereby minimizing the risk that we make false positive inferences about the effect of HHVBP. We also stratified at the state level in the model to account for greater homogeneity within states than across states, i.e. the variance of the outcome variable potentially being smaller within the state than in the population as a whole. Given that the HHVBP effect is analyzed at the national level and all HHA clusters are nested within states, stratification is a method of breaking up the population into different groups and accurately estimating the standard error of the estimates. Stratification exploits this homogeneity within states to produce smaller standard errors for a given overall sample size, thus minimizing the risk of false negative inferences (Type 2 errors) from hypothesis tests.

The derivation of the mean outcome in the HHVBP and comparison group by pre- and post-implementation period is presented below. The D-in-D estimators for 2016, 2017 and 2018 are given by the coefficients δ_1, δ_2 and δ_{32}, respectively. Between-group differences changed from α_1 in the pre-implementation period to $\alpha_1 + \delta_k, k = 1, 2$ in the post-implementation period. The D-in-D coefficient, δ_k, indicates whether between group differences increased ($\delta_k > 0, k = 1, 2$) or decreased ($\delta_k < 0, k = 1, 2$) after implementation of HHVBP.

Exhibit A-5. Difference-in-Differences Estimators for Individual Post-Implementation Years

Group	Pre-Implementation	Post-Implementation	Pre-Post Difference
2016 Difference-in-Differences Estimator			
HHVBP	$\alpha_0 + \alpha_1$	$\alpha_0 + \alpha_1 + \beta_1 + \delta_1$	$\beta_1 + \delta_1$
Non HHVBP	α_0	$\alpha_0 + \beta_1$	β_1
Between group	α_1	$\alpha_1 + \delta_1$	δ_1
2017 Difference-in-Differences Estimator			
HHVBP	$\alpha_0 + \alpha_1$	$\alpha_0 + \alpha_1 + \beta_2 + \delta_2$	$\beta_2 + \delta_2$
Non-HHVBP	α_0	$\alpha_0 + \beta_2$	β_2
Between group	α_1	$\alpha_1 + \delta_2$	δ_2
2018 Difference-in-Differences Estimator			
HHVBP	$\alpha_0 + \alpha_1$	$\alpha_0 + \alpha_1 + \beta_3 + \delta_3$	$\beta_3 + \delta_3$
Non-HHVBP	α_0	$\alpha_0 + \beta_3$	β_3
Between group	α_1	$\alpha_1 + \delta_3$	δ_3

We calculate the cumulative estimate as the weighted average of the yearly estimates to ensure that the cumulative estimate is more consistent with the yearly D-in-D estimates. This is a change from our method in the previous Annual Report, where we had grouped the post implementation years together and fitted a separate multivariate D-in-D model with same covariate specifications. We calculated the weights for each of the measure domains as follows:

- For the claims-based utilization measures - the proportion of claims episodes in each year
- For the claims-based Medicare spending measures - the proportion of days in each year
- For OASIS-based outcome measures – the proportion of OASIS episodes in each year

- For the OASIS-based process and HHCAHPS-based measures - the proportion of agencies in each year

A.1.5.2 Parallel Trends Testing

As discussed above, our primary analytic approach involved the use of a D-in-D estimator to measure the effects of HHVBP on a range of measures. With this estimator, we measured treatment effects based on changes occurring between the pre- and post-implementations periods in the nine HHVBP states relative to those occurring in the 41 comparison group states. We used a multivariate linear regression framework to adjust for key factors (i.e., Exhibit A-4) that remain imperfectly balanced between the two groups in a context of randomized selection and mandatory participation.

A key assumption with the D-in-D estimator is that the change in outcomes experienced in the comparison population is an accurate portrayal of the change that would have occurred in HHVBP states in the absence of HHVBP, also known as the parallel trends assumption. While the counterfactual of what would have occurred in the absence of HHVBP cannot be observed, we examined whether the measures of interest moved similarly over the baseline period (2013 to 2015) in the nine HHVBP states and the 41 comparison states. That is, we compared relative trends in these measures for the HHVBP and comparison groups during the three years prior to the implementation of HHVBP.

We conducted these analyses with two goals in mind. First, we used the results of these analyses to help inform our analytic approach, and specifically decisions about model covariate selection. As discussed above, one of the criteria we considered as the basis for selecting covariates for adjustment was the presence of differential trends between the HHVBP and comparison groups during the baseline period. We used analyses of baseline trends in impact measures to ascertain how well a particular model specification satisfied the parallel trends assumption. With the results of these analyses, we were able to consider whether certain types of covariates helped to strengthen the validity of this assumption. We considered such benefits in conjunction with any tradeoffs where the inclusion of additional covariates increased complexity and a lack of uniformity in our approach across impact measures. Secondly, beyond informing the design of our analytic approach, the results of these analyses also helped us to determine our level of confidence in using the resulting D-in-D estimator to make inferences about the effects of HHVBP as well as potentially motivating the exploration of alternative model specifications.

To accomplish these goals, we performed two types of analyses of parallel trends that adjust for our core set of covariates (i.e., Exhibit A-4) along with state fixed effects. Each type of analysis is discussed in turn below.

Comparison of Annual Trends between HHVBP and Non-HHVBP States

To assess parallel trends, we compared annual trends in impact measures between HHVBP and non-HHVBP states. We calculated the difference in means of the adjusted measure values for HHVBP and non-HHVBP states across the individual years of the baseline period (2013-2015) as well as for the implementation period (2016-2018). Similarly, we also calculated the difference in means of the unadjusted measure values for the two groups across the individual years.

For each of the eight key impact measures, we plotted the differences in both unadjusted and covariate-adjusted (with state fixed effects) measure values between HHVBP and non-HHVBP states in each year (with the difference calculated as the estimated HHVBP measure value minus the estimated non-HHVBP measure value). We examined the slopes of the plotted lines for each measure during 2013-2015, and

compared results based on an unadjusted regression model (i.e., having no beneficiary or agency characteristics as covariates) with results based on the adjusted model using the core set of covariates listed in Exhibit A-4 along with state fixed effects. Slopes of the plotted lines that were close to zero during 2013-2015 would indicate that impact measures for the two groups moved in a parallel manner over the baseline period.

We display results using plots of the difference in yearly means for each of eight key impact measures (Exhibit A-6), grouped as FFS claims-based quality measures, OASIS-based quality measures, and FFS claims-based Medicare spending measures. To facilitate interpretation of results across impact measures, the y-axis scales for the eight plots in Exhibit A-6 are standardized such that the difference between the minimum and maximum values shown on each y-axis corresponds to a difference of approximately 20% of the mean measure value for HHVBP and non-HHVBP states combined during 2013-2015. For example, the difference between the minimum and maximum values on the y-axis for the unplanned ACH measure plot (1.5% – (-1.5%) = 3.0%) corresponds to approximately 20% of the national average hospitalization rate of 16%.

Upward or downward sloping lines during 2013-2015 indicate a lack of parallel trends, as differences between the HHVBP and comparison groups become larger or smaller during the baseline period. For some of the measures – such as unplanned ACH – the unadjusted line (corresponding to the model without any covariate adjustment) shows evidence of a time trend. In comparison, with covariate adjustment, the plotted lines for these measures (including unplanned ACH) show greater indication of parallel trends in the adjusted measure values, with trend lines having slopes closer to zero. Together, these plots for the eight key impact measures reinforced two facts:

1. As clearly shown by the contrast between the unadjusted and adjusted plots, covariate adjustment tended to result in improvements in both the degree of balance and parallel trends between HHVBP and non-HHVBP groups during the baseline period.

2. Overall, the plotted lines showing trends in the difference in measure values between HHVBP and non-HHVBP populations from the adjusted model (that included state fixed effects) have slopes that tend to be close to zero for some impact measures (e.g., unplanned acute hospitalizations, improvement in ambulation) but not all measures.

Measures such as the three Medicare spending per day measures, with the exception of Medicare spending per day for acute hospitalization other measures tended to have downward slopes during the baseline period. This suggests that adjusting for state fixed effects alone is not adequate to account for non-parallel trends in the baseline period for all measures. It also reinforced the need to control for pre-HHVBP differences in trends between HHVBP and comparison states, thereby warranting a model that included both state fixed effects and state-specific linear trends along with other covariates for some impact measures, which are discussed in turn below.

Exhibit A-6. Assessing Parallel Trends for Key Impact Measures based on Unadjusted vs. Adjusted Models[6]

[6] The trend lines from the adjusted model (which includes an interaction term of the treatment indicator with each of the three levels of Ambulation and Locomotion along with other covariates and state fixed effects) are plotted on the assumption that the net effect of HHVBP on different levels of ambulation at the start of care is zero.

Falsification Test

We tested for differential changes in impact measures between the HHVBP and comparison groups between the first two years of the baseline period (i.e., 2013-2014) and the last year of the baseline period (i.e., 2015) as a "placebo test." That is, we applied the exact same D-in-D specification (as described above) while assigning 2013-2014 as the baseline period and falsely assigning 2015 as the post-intervention time period, and computed a D-in-D estimate for 2015. Such estimated effects for HHVBP for 2015 should be null since the initial HHVBP performance period did not begin until 2016. Where D-in-D estimates are not statistically different from zero, we would fail to reject the parallel trends assumption (i.e., suggesting that the impact measures moved in a parallel manner for the two groups over the baseline period).

Results of these falsification tests are summarized in Exhibits A-7 through A-11. We report the 2013 mean value for each impact measure in the HHVBP states to facilitate interpretation of the magnitude of the estimated 2015 HHVBP effect. We also use the mean value to calculate the relative change corresponding to the D-in-D falsification estimate for each measure, by expressing the estimated effect as a percentage of the 2013 mean value. The results of these calculations are shown in the last column of each table.

Results of falsification tests for the claims-based quality measures indicated null effects during 2015 for each of the six measures (Exhibit A-7).

For the claims-based spending measures, we found a null effect for Medicare spending for unplanned ACH (Exhibit A-8), but the D-in-D falsification estimates were all statistically significant (at $p < 0.10$ level) for the other three claims-based spending measures and corresponded to -0.6% to -0.9% of the mean value for these measures in 2013 (Exhibit A-8).

Overall, there was a stronger tendency for the falsification tests to indicate non-parallel trends for the OASIS outcome and process impact measures (Exhibits A-9 and A-10). In particular, there were statistically significant estimated effects (at $p<0.10$ level) for four of the eight OASIS outcome impact measures, with estimates at or exceeding 1.0% of the 2013 mean value for two measures (Improvement in Dyspnea and in Management of Oral Medications; Exhibit A-9). Similarly, there were statistically significant estimated effects (at $p<0.05$ level) for three of the six OASIS process impact measures, with an estimate exceeding 1% of the 2013 mean value for one measure (Influenza Immunization; Exhibit A-10).

Results of falsification tests for the HHCAHPS-based impact measures indicated null effects during 2015 for each of these five measures (Exhibit A-11).

Exhibit A-7. Results of Falsification Tests for Assessing the Impact of the HHVBP Model on FFS Claims-Based Quality Measures

Measure	Model Estimates			D-in-D Falsification[a, b]	Average Value in HHVBP States, 2013	Estimated Effect of Falsification Findings as % of 2013 Mean
	D-in-D[a]	Lower 90% CI[a]	Upper 90% CI[a]			
ED Use (no Hospitalization)/First FFS HH Episodes						
2016	0.25**	0.13	0.36	0.05	11.3%	0.5%
2017	0.21**	0.08	0.34			
2018	0.39**	0.25	0.53			
Cumulative	0.28**	0.18	0.39			
Unplanned Acute Care Hospitalization/First FFS HH Episodes						
2016	-0.29**	-0.43	-0.15	0.02	15.3%	0.1%
2017	-0.12	-0.27	0.03			
2018	-0.21**	-0.38	-0.05			
Cumulative	-0.21**	-0.33	-0.08			
Unplanned Acute Care Hospitalization/All FFS HH Episodes						
2016	-0.28**	-0.40	-0.16	0.03	16.8%	0.2%
2017	-0.27**	-0.41	-0.13			
2018	-0.36**	-0.51	-0.21			
Cumulative	-0.30**	-0.42	-0.19			
Unplanned Hospital Readmission in the First 30 Days of HH Care						
2016	-0.45**	-0.65	-0.25	0.19	13.1%	1.5%
2017	-0.10	-0.31	0.11			
2018	-0.17	-0.40	0.05			
Cumulative	-0.25**	-0.42	-0.09			
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care						
2016	0.11	-0.05	0.27	-0.04	9.3%	-0.4%
2017	-0.01	-0.18	0.17			
2018	0.15	-0.04	0.33			
Cumulative	0.09	-0.04	0.22			
SNF Use/All FFS HH Episodes						
2016	-0.20**	-0.25	-0.14	-0.06	4.7%	-1.2%
2017	-0.23**	-0.30	-0.16			
2018	-0.29**	-0.36	-0.21			
Cumulative	-0.24**	-0.29	-0.19			

*[a]Values represent percentage point changes. [b]Represents the estimated effect of HHVBP in 2015. **p<0.05.*
CI= Confidence Interval | HHVBP performance measures in italics.

Exhibit A-8. Results of Falsification Tests for Assessing the Impact of the HHVBP Model on FFS Claims-Based Spending Measures

Measure	Model Estimates			D-in-D Falsification[a]	Average Value in HHVBP States, 2013	Estimated Effect of Falsification Findings as % of 2013 Mean
	D-in-D	Lower 90% CI	Upper 90% CI			
Average Medicare Spending per Day during and following FFS HH Episodes of Care						
2016	-$2.22**	-$2.83	-$1.60	-$0.81**	$135.41	-0.6%
2017	-$3.58**	-$4.31	-$2.84			
2018	-$3.74**	-$4.59	-$2.90			
Cumulative	-$3.20**	-$3.84	-$2.56			
Average Medicare Spending per Day during FFS HH Episodes of Care						
2016	-$2.23**	-$3.01	-$1.45	-$1.03**	$148.29	-0.7%
2017	-$3.72**	-$4.62	-$2.82			
2018	-$4.17**	-$5.21	-$3.13			
Cumulative	-$3.42**	-$4.24	-$2.61			
Average Medicare Spending per Day following FFS HH Episodes of Care						
2016	-$1.81**	-$2.68	-$0.93	-$0.95*	$102.09	-0.9%
2017	-$2.40**	-$3.37	-$1.44			
2018	-$1.71**	-$2.82	-$0.60			
Cumulative	-$1.95**	-$2.77	-$1.13			
Average Medicare Spending per Day for Unplanned Acute Care Hospitalizations among all FFS HH Episodes						
2016	-$0.96**	-$1.29	-$0.64	$0.12	$32.97	0.4%
2017	-$0.98**	-$1.35	-$0.61			
2018	-$0.98**	-$1.42	-$0.55			
Cumulative	-$0.99**	-$1.31	-$0.66			

[a] *Represents the estimated effect of HHVBP in 2015. *p<0.10, **p<0.05.*

CI= Confidence Interval

Exhibit A-9. Results of Falsification Tests for Assessing the Impact of the HHVBP Model on OASIS-Based Outcome Impact Measures

Measure	Model Estimates			D-in-D Falsification[a, b]	Average Value in HHVBP States, 2013	Estimated Effect of Falsification Findings as % of 2013 Mean
	D-in-D[a]	Lower 90% CI[a]	Upper 90% CI[a]			
Discharged to Community						
2016	-0.24	-0.49	0.02	-0.64**	73.0%	-0.9%
2017	-0.56**	-0.86	-0.26			
2018	-0.68**	-1.03	-0.32			
Cumulative	-0.52**	-0.80	-0.24			
Improvement in Ambulation-Locomotion						
2016	0.40	-0.09	0.88	-0.27	62.5%	-0.4%
2017	0.16	-0.39	0.72			
2018	0.10	-0.44	0.65			
Cumulative	0.21	-0.26	0.68			
Improvement in Bathing						
2016	0.38	-0.21	0.96	-0.30	69.3%	-0.4%
2017	0.58	-0.08	1.24			
2018	0.51	-0.12	1.14			
Cumulative	0.45	-0.11	1.02			
Improvement in Bed Transferring						
2016	0.77**	0.27	1.26	-0.11	58.3%	-0.2%
2017	0.84**	0.26	1.43			
2018	0.86**	0.29	1.44			
Cumulative	0.90**	0.41	1.40			
Improvement in Dyspnea						
2016	1.28**	0.70	1.86	0.66*	64.5%	1.0%
2017	1.44**	0.75	2.14			
2018	1.02**	0.37	1.68			
Cumulative	1.30**	0.72	1.89			
Improvement in Management of Oral Medications						
2016	2.49**	1.70	3.27	0.65*	48.8%	1.3%
2017	3.99**	3.04	4.94			
2018	4.40**	3.44	5.37			
Cumulative	3.66**	2.84	4.49			
Improvement in Pain Interfering with Activity						
2016	0.25	-0.31	0.81	-0.54**	70.3%	-0.8%
2017	0.19	-0.50	0.88			
2018	-0.18	-0.90	0.55			
Cumulative	0.04	-0.57	0.64			
Improvement in Status of Surgical Wounds						
2016	-0.07	-0.43	0.29	-0.23	90.2%	-0.3%
2017	0.23	-0.27	0.73			
2018	0.16	-0.43	0.76			
Cumulative	0.10	-0.33	0.53			

*[a]Values represent percentage point changes. [b]Represents the estimated effect of HHVBP in 2015. *p<0.10, **p<0.05.*
CI= Confidence Interval. | HHVBP performance measures in italics.

Exhibit A-10. Results of Falsification Tests for Assessing the Impact of the HHVBP Model on OASIS-Based Process Impact Measures

Measure	Model Estimates			D-in-D Falsification[a, b]	Average Value in HHVBP States, 2013	Estimated Effect of Falsification Findings as % of 2013 Mean
	D-in-D[a]	Lower 90% CI[a]	Upper 90% CI[a]			
Influenza Immunization Received for Current Flu Season						
2016	3.36**	2.60	4.13	2.56**	63.3%	4.0%
2017	3.09**	2.26	3.92			
2018	2.73**	1.85	3.60			
Cumulative	3.08**	2.37	3.80			
Pneumococcal Polysaccharide Vaccine Ever Received						
2016	1.55**	0.78	2.33	0.11	65.7%	0.2%
2017	0.86*	0.01	1.70			
2018	0.32	-0.57	1.21			
Cumulative	0.93**	0.19	1.67			
Depression Assessment Conducted						
2016	0.13	-0.20	0.46	-0.08	95.5%	-0.1%
2017	0.35	-0.03	0.73			
2018	0.03	-0.40	0.46			
Cumulative	0.16	-0.16	0.48			
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care						
2016	0.76**	0.33	1.18	0.41	91.6%	0.4%
2017	1.36**	0.90	1.82			
2018	1.38**	0.91	1.85			
Cumulative	1.17**	0.79	1.56			
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate						
2016	0.31**	0.14	0.48	0.33**	97.8%	0.3%
2017	0.22**	0.05	0.39			
2018	0.11	-0.11	0.32			
Cumulative	0.20**	0.05	0.36*			
Timely Initiation of Care						
2016	-0.05	-0.36	0.25	-0.54**	92.6%	-0.6%
2017	0.05	-0.28	0.38			
2018	-0.09	-0.44	0.26			
Cumulative	-0.04	-0.31	0.22			

*[a]Values represent percentage point changes. [b]Represents the estimated effect of HHVBP in 2015. *p<0.10, **p<0.05.*
CI= Confidence Interval. | HHVBP performance measures in italics.

Exhibit A-11. Results of Falsification Tests for Assessing the Impact of the HHVBP Model on HHCAHPS-Based Impact Measures

Measure	Model Estimates			D-in-D Falsification[a, b]	Average Value in HHVBP States, 2013	Estimated Effect of Falsification Findings as % of 2013 Mean
	D-in-D[a]	Lower 90% CI[a]	Upper 90% CI[a]			
How often the home health team gave care in a professional way						
2016	-0.10	-0.33	0.13	-0.06	89.0%	-0.1%
2017	0.04	-0.22	0.29			
2018	-0.06	-0.32	0.20			
Cumulative	-0.04	-0.23	0.15			
How well did the home health team communicate with patients						
2016	-0.21	-0.48	0.05	-0.24	86.2%	-0.3%
2017	-0.03	-0.32	0.26			
2018	-0.28	-0.58	0.01			
Cumulative	-0.18	-0.40	0.04			
Did the home health team discuss medicines, pain, and home safety with patients						
2016	-0.34*	-0.65	-0.04	0.22	82.9%	0.3%
2017	0.26	-0.06	0.58			
2018	-0.19	-0.54	0.15			
Cumulative	-0.10	-0.34	0.15			
How do patients rate the overall care from the home health agency						
2016	-0.10	-0.48	0.29	-0.16	84.7%	-0.2%
2017	0.04	-0.35	0.44			
2018	0.26	-0.14	0.67			
Cumulative	0.07	-0.23	0.37			
Would patients recommend the home health agency to friends and family						
2016	0.01	-0.44	0.46	-0.30	79.8%	-0.4%
2017	0.31	-0.15	0.77			
2018	0.41	-0.08	0.91			
Cumulative	0.24	-0.11	0.60			

[a]Values represent percentage point changes. [b]Represents the estimated effect of HHVBP in 2015. p<0.10, **p<0.05. CI= Confidence Interval. | HHVBP performance measures in italics.*

The validity of inferences that are based on the D-in-D estimator will depend on whether the assumption of parallel trends between the treatment and comparison groups during the baseline period is satisfied. If baseline trends for the two groups were not found to be parallel, the comparison group would not provide a strong counterfactual for what would have been observed in the post-implementation period in the absence of HHVBP. Instead, the D-in-D estimator would, in part, capture the effects of any pre-existing differential trends between the two groups, where those trends would have otherwise continued in the post-implementation period. This would lead D-in-D estimates to either overestimate or underestimate the true effects of the treatment. Since our falsification tests rejected the null hypothesis of no difference in baseline trends between HHVBP and non-HHVBP states for certain impact measures of interest, we explored alternative model specifications for estimating the effects of HHVBP on these impact measures. As described below, for the impact measures that failed to pass the falsification test with a model specification that adjusted for a set of covariates and state fixed effects, we also adjusted for state-specific linear trends to account for any non-parallel linear trends in the baseline period between the states.

A.1.5.3 Incorporating State-Specific Linear Time Trends to Account for Non-Parallel Trends during the Baseline Period

Given our findings of non-parallel trends in certain impact measures during the baseline period, we conducted regression analyses using an alternative D-in-D model that incorporated state-specific linear time trends. We added linear time trends interacted with each state indicator along with state fixed effects to the covariate list discussed above in Section A.1.4, which can be used to account for different linear trends during the baseline period between the states.

Defining each episode *i* in time *t*, identifying the treatment episodes with an indicator variable $Treat_i$, identifying the post-implementation year variables *t* with an indicator variable $I(t = t_k)$, and identifying a vector of covariates as $\mathbf{P}_{Cov}$ (defined in Section A.1.4), the D-in-D estimator for outcome *Y* that included state-specific linear time trends was implemented as:

$$Y_{i,t} = \alpha_0 + \alpha_1 Treat_i + \sum_{k=1}^{k=3} \beta_k I(t = t_k) + \sum_{k=1}^{k=3} \delta_k Treat_i * I(t = t_k) + \sum_{j=1}^{j=3} \rho_j I(q = j) + \sum_{s=3}^{s=50} \theta_s I(S = s) + \sum_{s=1}^{s=50} \gamma_s time * I(S = s) + \omega \mathrm{P}_{Cov} + \epsilon_{i,q,t}$$

where *k* = 1 for 2016, *k* =2 for 2017 and *k* = 3 for 2018

- $Treat_i$: 1, 0 indicator (1= HHVBP states, 0= Non-HHVBP states)
- $I(t = t_1)$: 1 , 0 indicator (1 when year = 2016, 0 otherwise)
- $I(t = t_2)$: 1 , 0 indicator (1 when year = 2017, 0 otherwise)
- $I(t = t_3)$: 1 , 0 indicator (1 when year = 2018, 0 otherwise)
- α_0 is an intercept
- α_1 is the average difference between the HHVBP and comparison populations over the pre-implementation period
- β_k is the average change from pre- to post-implementation for the HHVBP population, where *k* = 1 for year 2016, *k* = 2 for year 2017, and *k* = 3 for year 2018

- δ_k is the yearly D-in-D effect, for *k* = 1, 2, 3; the difference in the change from pre-implementation to post-implementation for the HHVBP population relative to the comparison population (i.e., to estimate the treatment effect of HHVBP) from a model that adjusts for state fixed effects and state-specific linear trends
- ρ_j coefficients capture seasonal effects associated with the four quarters of the year, where *j* = 1, 2, 3 (one quarter omitted as reference)
- $I(S = s)$: 1, 0 indicator (1 when from state *s*, 0 otherwise); two states omitted as reference since "treat" is also included in the model
- θ_s coefficients are fixed effects for each state *s*
- $time$: linear term ranging from 2013-2018
- γ_s: coefficients associated with state-specific linear trends, time trends for each state interacted with fixed effects indicator for each state *s*
- ω is a vector of coefficients associated with the vector of covariates $\mathbf{P}_{Cov}$
- $\epsilon_{i,q,t}$ episode-specific error term

With this model, the D-in-D estimator measures the difference in the deviations from the average of the state trend lines between the HHVBP and comparison groups in the post-HHVBP period, while accounting for any non-parallel linear trends in the baseline period between the states.

In the regression equation, we included three estimates (ρ_1, ρ_2, ρ_3) capturing quarterly effects since we included a constant in the equation. Each episode was given an equal weight except for the four average Medicare spending per day measures, which were weighted by the number of days included in the denominator (see Section A.2.2). As with our primary D-in-D model specification, standard errors were clustered at the agency level (see Section A.1.4.1). In order to obtain the average annual (cumulative) impact estimate over the three HHVBP Model years (i.e., 2016-2018), we calculated a linear combination of the three year-specific impact estimates with each year's impact weighted by the number of HHVBP episodes in that year, or in the case of the spending measures, weighted by the sum of denominator days in HHVBP states for the year.

Exhibit A-12 shows a side-by-side comparison of the cumulative D-in-D estimates obtained from two alternative D-in-D models for the measure sets where there was a pattern of non-parallel trends for some of the individual measures. The first column reports estimates based on the D-in-D model specified in Section A.1.5.1, followed by the falsification results corresponding to the same model specification (these results are identical to those presented in Exhibits A-8 through A-10 above). The last column presents estimates from the D-in-D model that incorporates state-specific linear trends.

Broadly, results from the D-in-D model that adjusts for state-specific linear time trends along with state fixed effects (i.e., in the last column) are in the direction we would expect based on a combination of results from the primary D-in-D model (i.e., in the first column of results) and the falsification test (i.e., in the second column). For example, the inclusion of state-specific linear time trends results in a smaller but still statistically significant reduction in the measure of total Medicare spending during and following home health care when accounting for the relative decline already occurring in HHVBP states in the pre-HHVBP period (i.e., D-in-D estimates of $1.62 vs. $3.20). Similarly, the inclusion of linear trends by state resulted in a smaller but still statistically significant improvement in dyspnea when accounting for the relative improvement already occurring in HHVBP states in the pre-HHVBP period (i.e., D-in-D estimates of 0.46% vs. 1.30%).

Exhibit A-12. Comparison of Cumulative D-in-D Estimates between Models with and without State-Specific Linear Time Trends

Measures	D-in-D Estimate[a]	Falsification[b]	D-in-D Estimate with State-Specific Linear Time Trend[a]
FFS Claims-Based Spending Measures			
Average Medicare Spending per Day for Unplanned ACH/FFS HH Episodes	-$0.99**	$0.12	-$1.50**
Average Medicare Spending per Day among FFS HH beneficiaries during and following HH Episodes of Care	-$3.20**	-$0.81**	-$1.62**
Average Medicare Spending per Day among FFS HH beneficiaries during HH Episodes of Care	-$3.42**	-$1.03**	-$1.40**
Average Medicare Spending per Day among FFS HH beneficiaries following HH Episodes of Care	-$1.95**	-$0.95*	$0.13
OASIS Outcome Impact Measures[c]			
Discharged to Community	-0.52**	-0.64**	0.65**
Improvement in Ambulation-Locomotion	0.21	-0.27	0.79*
Improvement in Bathing	0.45	-0.30	1.28**
Improvement in Bed Transferring	0.90**	-0.11	1.30**
Improvement in Dyspnea	1.30**	0.66*	0.46
Improvement in Management of Oral Medications	3.66**	0.65*	2.86**
Improvement in Pain Interfering with Activity	0.04	-0.54**	1.61**
Improvement in Status of Surgical Wounds	0.10	-0.23	0.56
OASIS Process Impact Measures[c]			
Influenza Immunization Received for Current Flu Season	3.08**	2.56**	-1.19
Pneumococcal Polysaccharide Vaccine Ever Received	0.93**	0.11	0.44
Depression Assessment Conducted	0.16	-0.08	0.25
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	1.17**	0.41	0.18
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	0.20**	0.33**	-0.36*
Timely Initiation of Care	-0.04	-0.54**	1.01**

*[a] Cumulative estimates for 2016-18 combined. | [b] Represents the estimated effect of HHVBP in 2015. | [c] Represents percentage point changes. * p<0.10, **p<0.05. | HHVBP performance measures in italics.*

Although incorporating state-specific linear time trends in our D-in-D framework allows us to account for non-parallel trends in the baseline period between the HHVBP and comparison groups for certain impact measures, it assumes that the average difference in slopes between the HHVBP state trends and the comparison state trends observed in the baseline period would have continued to change at the same rate in the absence of HHVBP. This will be an increasingly strong assumption to make throughout the course of this eight-year evaluation.

We therefore only incorporated state-specific linear time trends for the three measure sets that failed the falsification test: the FFS claims-based Medicare spending measures and the OASIS-based outcome and process measures (Exhibits A-8 through A-10). Though not all measures in each of the measure sets rejected the null hypothesis of parallel trends in the baseline period (for example, three out of four FFS claims spending measures, four out of eight OASIS outcome measures, and three out of six OASIS process measures rejected the parallel trends test) we used state-specific linear time trends for all measures within these measure sets. This was done to facilitate interpretation of results among strongly related impact measures and to maintain a uniform analytic approach where possible. We employed the simpler D-in-D model specification discussed in Section A.1.5.1 for our analyses of the claims-based and HHCAHPS-based quality measures given the overall null findings for the falsification test for these measures (Exhibits A-7 and A-11).

It is possible for there to be residual non-linear, non-parallel trends based on a model that adjusts for state fixed effects and state-specific linear trends. Moreover, there may be non-linear trends in impact measures at the state level that deviate from the D-in-D assumptions; this becomes relevant as we develop state-specific analyses for subsequent reports. We will continue to analyze the influence of such potential deviations from model assumptions on impact estimates throughout the course of this evaluation.

A.1.6 Comparison Group for State-Level Analyses

For the state-specific analyses presented in this report, the choice of an appropriate comparison group for each HHVBP state was largely driven by the extent of balance that exists between the treatment and comparison group on factors that can potentially impact outcomes of interest. Achieving this balance and reducing observed differences in the two populations was important as it would otherwise lead us to erroneously infer an effect of HHVBP that was actually a result of differences in the underlying populations. Leveraging the design of the model, the regional groupings from which CMS randomly selected the HHVBP states, were used as comparison groups for each state as listed below (Exhibit A-13). As specified in the CY 2016 Final Rule[7], each regional grouping included states that were similar in utilization, demographics, and clinical characteristics while being geographically located in close proximity to one another. Another motivation for choosing the regional groupings as comparison groups was that collectively they constituted all the 41 non-HHVBP states which would help us to reconcile the national level results with the state-specific results.

Exhibit A-13. HHVBP States and their Corresponding Regional Groupings

HHVBP State	Non-HHVBP States in Regional Grouping
Arizona (AZ)	New Mexico, California, Nevada, Utah, Colorado
Florida (FL)	Texas, Oklahoma, Louisiana, Mississippi
Iowa (IA)	North Dakota, South Dakota, Montana, Wisconsin, Minnesota
Massachusetts (MA)	Vermont, Maine, Connecticut, Rhode Island, New Hampshire
Maryland (MD)	Delaware, New Jersey, Pennsylvania, New York
North Carolina (NC)	Alabama, Georgia, South Carolina, Virginia
Nebraska (NE)	Ohio, West Virginia, Indiana, Missouri, Kansas

[7] See 2015 Final Rule here.

HHVBP State	Non-HHVBP States in Regional Grouping
Tennessee (TN)	Illinois, Kentucky, Arkansas, Michigan
Washington (WA)	Oregon, Alaska, Hawaii, Wyoming, Idaho

Based on our assessment of the degree of balance in a wide range of the characteristics of each HHVBP state and the regional grouping from which it was selected, and a goal of maintaining uniformity with the approach we use for our national-level analyses, we adopted a comparison group approach for individual states. This approach leveraged these regional groupings and reflected the use of multivariate regression to account for a minority of factors where reasonably close balance was not achieved. As an objective measure to evaluate balance between the treatment and comparison groups, we computed "standardized bias" or "standardized difference in means" for each factor, which is defined as the difference in means between two groups divided by the standard deviation of the treatment group. In Section C.11.1 of the Appendix of Supplemental Tables and Results, we demonstrate balance between the HHVBP states and their respective regional groupings on the covariates used as factors in our multivariate regression model (Exhibits C-35 through C-37) and impact measures (Exhibits C-38 through C-40). We have shaded values where the absolute standardized differences of means is greater than 0.25, which is a widely used benchmark for evaluating balance.[8,9] To facilitate comparison, we also included means of all HHVBP states, means of all non-HHVBP states, and standardized difference in means between HHVBP and non-HHVBP states in columns 2-4 of each table (Exhibits C-35 through C-40).

As shown in the Appendix of Supplemental Tables and Results, most of the covariates (Exhibits C-35 through C-37) and the priority measures (Exhibits C-38 through C-40) exhibited a reasonably strong degree of balance between the HHVBP state and its corresponding regional grouping. The factors that demonstrated less balance at the state level also tended to show less balance at the national level (e.g. beneficiary race/ ethnicity, agency for-profit, non-profit, or government ownership, hospital or freestanding setting, chain status, and agency size). Given the extent of diversity in beneficiary and HHA characteristics and treatment patterns across states and in the impact measures of interest, it was not possible to achieve close balance on all factors across states. As we did for our analyses of the impact of HHVBP at the national level, we used multivariate regression to achieve balance on those factors that remained imperfectly balanced between each HHVBP state and its respective comparison group.

As an additional method of checking balance in the baseline period, we also tested the assumption of parallel baseline trends in impact measures between the HHVBP states and their respective regional comparison group using a placebo test/falsification test. Using 2013-2014 as the baseline period and falsely assigning 2015 as the post-implementation period, we estimated effects for HHVBP in 2015 (as detailed in Section A.1.5.2). The placebo test helped to identify any relevant trends that preceded implementation of HHVBP and ascertain how well a particular choice of comparison group and model selection satisfied the parallel trends assumption.

[8] Stuart EA. (2010) Matching Methods for Causal Inference: A review and a look forward. *Statistical science: a review journal of the Institute of Mathematical Statistics* 25(1).

[9] Cochran WG, Rubin DB. (1973) Controlling Bias in Observational Studies: A review. *Sankhyā: The Indian Journal of Statistics*, Series A: 417-446.

For testing, we used the same model specifications that included the covariates listed in Exhibit A-4 along with state-fixed effects, as was done for our national level analyses. We concluded that using regional groupings as the comparison group for each of the nine HHVBP states helped to achieve an overall pattern of reasonably similar baseline trends for many of the impact measures of interest for this evaluation. Results of the placebo test showed that 78 out of 261 measures (i.e., 29 measures across 9 states) demonstrated non-parallel trends in the baseline period (Exhibit C-41 in Section C.11.2 of the Appendix of Supplemental Tables and Results). At the national level, for impact measures that exhibited a lack of parallel trends during the baseline period, we incorporated state-specific linear time trends (Section A.1.5.3). Similarly at the state level, for impact measures exhibiting a lack of parallel trends during the baseline period, we incorporated state-specific linear time trends for measure sets. At the state level, these measure sets were FFS claims-based utilization measures, FFS claims-based Medicare spending measures, OASIS-based outcome and process measures. For these measure sets, we adjusted for state-specific linear trends to account for any non-parallel linear trends in the baseline period between the states.

A.1.7 Analytic Approach for Agency Total Performance Scores

As a metric that combines agency performance on the range of quality measures included in HHVBP and used to determine Medicare payment adjustments for HHAs in the HHVBP states, the TPS score represents a broad measure of agency performance that is incentivized under HHVBP. As such, the TPS score is of interest as an overall performance indicator for comparison between agencies in model states with those in non-model states where this metric does not affect Medicare payments to HHAs.

Given the considerations discussed in this section, we examined the impact of the HHVBP Model on overall agency performance by comparing TPS scores in model states with those in non-model states. We used multivariate linear regression to examine agency TPS scores in each year from 2016-2018 while accounting for differences in certain characteristics of HHAs between HHVBP and non-HHVBP states. These factors included agency size, chain status, ownership type, age, and freestanding versus hospital-based, as well as indicators of patient demographic characteristics and insurance.

As discussed above, our primary analytic approach for this evaluation involves a D-in-D methodology, where we test for differential changes from the baseline period to the post-HHVBP period in the model group relative to the comparison group. A D-in-D approach to examining TPS scores, however, is not optimal over the duration of this evaluation and was not used. A key consideration is that the methodology for computing TPS scores is expected to change over time. For example, one of the initial performance measures, the Drug Education on All Medications Provided to Patient/Caregiver during All Episodes of Care, was removed from the HHVBP measure set starting in the third performance year of the model (2018) since many HHAs were found to be achieving full performance on this measure[10]. Further changes to both the HHVBP measure set and to the measure weights took effect in 2019, the fourth performance year of the model[11]. One effect of such changes in methodology is that TPS scores from different payment years are less comparable, as changes in TPS scores across payment years may in part reflect changes in the components of the TPS rather than necessarily changes in agency performance.

[10] See 2017 Final Rule here.
[11] See 2018 Final Rule here.

In addition, the TPS score already captures changes over time in performance. For each HHA, the TPS score is calculated by summing the applicable measure scores. For each measure, the performance of individual HHAs is measured based on a combination of (a) their levels of achievement on the measure relative to their state cohort's performance during the baseline period and (b) their improvement over time relative to their own previous performance levels. For each measure, agencies receive the higher of their achievement score or their improvement score. However, regardless of which score is higher for a specific measure, the average score that results among HHAs in a state represents a measure of improvement in performance relative to that observed in a prior period—whether to that of the overall state cohort or of those particular HHAs. As a result, the TPS calculation inherently captures changes over time in performance, which are reflected in the results of a cross-sectional regression analysis.

As a test of whether the HHA measure scores (which comprise the TPS) reflect improvement relative to an HHA's own baseline as well as its state cohort's baseline, we examined correlations between average measure scores among HHAs in each state and each of the following:

- The average difference between the measure rate for each HHA during the performance period and its state-level achievement threshold.[12]
- The average difference between the measure rate for each HHA during the performance period and its own baseline performance measure rate.

Among the individual performance measures, we generally found correlations of between 0.6 and 0.9 for both types of correlations above (see Exhibit C-8 in the Supplemental Tables and Results). These results indicate that average HHA measure scores in a state have a moderately strong correlation with *both* (a) the amount by which average HHA performance levels in a given performance year exceed their state cohort's baseline performance and (b) the extent of improvement in average HHA performance over baseline performance. That is, in the aggregate, higher measure scores tended to indicate greater improvement in HHA performance relative to both the state cohort's baseline performance and to an HHA's own baseline performance.

A limitation of comparing TPS scores across states is that each agency's achievement on a measure is determined relative to the baseline performance for that agency's specific state cohort. The achievement thresholds and benchmarks that were used to determine agency achievement scores were calculated separately for each state. HHA achievement scores are therefore calculated relative to baseline performance levels that can vary across states. Large differences across states in baseline performance levels used to calculate measure scores could theoretically have implications for comparisons of measure scores and, in turn, TPS scores across states or groups of states. Therefore, we examined relative performance in HHVBP and non-HHVBP states to rule out the possibility of higher average achievement scores among agencies in HHVBP states being due to a lower baseline level of performance among agencies in those states. This scenario would indicate greater room for improvement at the time the HHVBP Model was implemented. Below, we examined (and rejected) the possibility that differences in baseline performance levels between agencies in HHVBP and non-HHVBP states might have implications for comparisons of TPS scores between these groups.

[12] See 2015 Final Rule here.

For each HHVBP measure, we examined achievement thresholds and benchmarks among agencies in HHVBP states relative to non-HHVBP states in 2018 (Exhibit A-14).[13] For HHVBP measures that reflect indicators of utilization based on Medicare claims (i.e., ACH and ED visits), indicators of care processes based on OASIS data, and indicators of patient satisfaction based on HHCAHPS data, average achievement thresholds and average benchmarks were within one half of one percentage point. For example, during 2018, the average achievement threshold for the unplanned ACH measure was 15.9% among agencies in HHVBP states and 15.6% among those in non-model states.

Exhibit A-14. Average Measure Achievement Thresholds and Benchmarks, HHVBP Performance Year 2018

HHVBP Performance Measure	Average Achievement Threshold		Average Benchmark	
	HHVBP	Non-HHVBP	HHVBP	Non-HHVBP
ED Use (no Hospitalization)/First FFS Home Health Episodes	11.9%	12.3%	6.3%	6.0%
Unplanned ACH/First FFS Home Health Episodes	15.9%	15.6%	9.1%	8.8%
Discharged to Community	71.1%	69.5%	83.5%	85.0%
Improvement in Ambulation/Locomotion	66.1%	63.0%	84.9%	84.6%
Improvement in Bathing	70.8%	67.4%	88.0%	88.5%
Improvement in Bed	62.0%	57.8%	81.6%	82.4%
Improvement in Management of Oral Medications	54.0%	52.1%	74.3%	76.0%
Improvement in Dyspnea	69.7%	64.6%	88.0%	87.4%
Improvement in Pain Interfering with Activity	71.4%	67.1%	90.5%	90.9%
Influenza Immunization Received for Current Flu Season	67.8%	68.7%	91.0%	90.3%
Pneumococcal Polysaccharide Vaccine Ever Received	71.4%	73.3%	93.6%	94.6%
How often the home health team gave care in a professional way	89.1%	88.9%	94.2%	94.0%
How well did the home health team communicate with patients	86.3%	85.8%	91.9%	92.3%
Did the home health team discuss medicines, pain, and home safety with patients	83.8%	83.9%	90.3%	91.6%
How do patients rate the overall care from the home health agency	84.8%	84.8%	93.0%	93.1%
Would patients recommend the home health agency to friends and family	80.2%	79.7%	90.5%	90.5%

For the OASIS-based measures of patient outcomes, differences between the two groups in the average achievement thresholds typically ranged between two and five percentage points, with higher thresholds for the HHVBP group. This included the six outcome improvement measures and the discharge to community measure. For example, the average achievement threshold for the measure of improvements in ambulation status was 66.1% among HHAs in HHVBP states and 63.0% among those in non-model states. Differences in the average benchmarks were smaller, generally within one percentage point.

[13] Achievement threshold is defined as the median measure value for all HHAs in the state during the baseline period, and the benchmark is defined as the mean measure value for the best performing decile of all HHAs in the state during the baseline period. See 2015 Final Rule here.

Average agency achievement thresholds and benchmarks among agencies in HHVBP and non-HHVBP states were virtually identical for the two previous performance years, since they used the same baseline year (2015) as performance year 2018 (e.g., see Exhibit C-9 in the Appendix of Supplemental Tables and Results for the corresponding results for performance year 2016). These comparisons do not suggest systematic, large differences between the HHVBP and non-HHVBP groups in baseline performance levels when comparing HHA measure scores and TPS scores.

A.2 Variable and Impact Measure Definitions

Below, we describe how we specified and defined descriptive variables and impact measures that were used in this Annual Report.

A.2.1 Descriptive Variables

A.2.1.1 Beneficiary Characteristics

Total Number of Beneficiaries Receiving Home Health Care. Home health claims and OASIS episodes of care were used to identify and count the number of unique home health beneficiaries with at least one home health claim or OASIS episode of care in a specified time period.

Age. Age was calculated based on the floored (i.e., rounding down to nearest integer) year difference between patient birth date on the OASIS assessment and the OASIS assessment effective date; if the OASIS information was missing, then age was calculated based on the floored year difference between patient date of birth and the claims-based episode start date.

Gender. Gender indicator was primarily derived from the OASIS assessment item M0069; if the OASIS information was missing, then gender was derived from the variable SEX_IDENT_CD in the Master Beneficiary Summary File (MBSF) Base segment data file.

Race/Ethnicity. Race indicators (white, black, Hispanic, other race) came from OASIS assessment item M0140; American Indian or Alaska Native, Asian and Native Hawaiian or Pacific Islander are grouped into the "other" race category. The OASIS item allows for selection of more than one race; therefore, a patient could have multiple race flags indicated. If the OASIS information was missing, then RTI_RACE_CD from the MBSF Base segment data were used to calculate race indicators. We recoded race categories to mutually exclusive groups using the following rules:

- Hispanic (regardless of black/white/other race)
- Black (as the only race indicated; will be non-Hispanic)
- White (as the only race indicated; will be non-Hispanic)
- Other (as the only race indicated; will be non-Hispanic)
- Multiracial (combination of black/white/other race; will be non-Hispanic)

Dual Eligible. For the month that a given claim-based episode starts or an OASIS-based episode of care ends, dual status indicators were evaluated in the MBSF. If the beneficiary was in the MBSF Base segment data and had Dual Status code value in ('01','02','03','04','05','06','08'), then their Dual flag was set to 1 for that episode. Otherwise, if they did not have enrollment data for that month in the MBSF or if the Dual Status code was not in ('01','02','03','04','05','06','08'), then their Dual flag was set to 0.

Medicaid Only (either Health Maintenance Organization [HMO] or FFS without dual). For OASIS episodes of care, beneficiaries were marked as Medicaid Only, if they were not dual eligible, as defined via MBSF, and OASIS item M0150 ('Current Payment Sources for Home Care') indicated either '3 - Medicaid (traditional fee-for-service)' or '4 - Medicaid (HMO/managed care).'

Rural/Urban. County Core-Based Statistical Area (CBSA) codes from the Area Health Resource File (AHRF) data were used to identify rural counties (i.e., those that lacked a CBSA code) and urban counties (i.e., those with a CBSA code). Rural/urban indicators were then matched to beneficiaries' county information as derived from the ZIP code reported on the OASIS assessment form. If ZIP code was not

available from the OASIS assessment, then the county where home health services were provided was derived based on a hierarchy of data sources: CBSA code reported on the home health claim, beneficiary ZIP code from OASIS assessment nearest to the home health claim start date, beneficiary address reported on the home health claim, and the beneficiary county provided at month-level in the MBSF Base segment. If beneficiary county of residence/treatment was not available in any of these data sources, then the ZIP code of the HHA providing care was used to derive county information.

Health Conditions. The following chronic health conditions were reported for home health beneficiaries on an annual basis: chronic kidney disease, congestive heart failure, diabetes, ulcers, Alzheimer's disease or related senile dementia, ischemic heart disease, and anemia. These indicators were pulled from the MBSF Chronic Conditions and Other Chronic Conditions segments. The condition flags were provided at both the middle and end of each year for each Medicare beneficiary; for this report, only end-of-year condition flags were used. The original chronic condition flags have four levels: 1) neither claim nor coverage criteria were met; 2) claim criteria met, coverage criteria not met; 3) claim criteria not met, coverage criteria met; 4) claims and coverage criteria met. Claims criteria are met when the beneficiary has a claim that includes a related diagnosis or procedure code during the given condition's reference period. Coverage criteria are met when the beneficiary is enrolled in full FFS (Medicare Parts A and B) for the entire condition reference period. Our analyses reduced these chronic condition flags to three levels: 1) Beneficiary has condition (claims criteria were met, regardless of coverage criteria); 2) Beneficiary does not have condition (claims criteria were not met); 3) Beneficiary does not have MBSF Chronic Condition data available for the year.

Reason for Medicare Entitlement. Original and current reasons for Medicare entitlement were determined using the entitlement reason variables from the MBSF Base segment, associated with a claims-based home health episode based on the year in which the episode began. Beneficiary Medicare entitlement was coded as disabled, ESRD, or both.

Percentage of Persons aged 25 years or older with less than a high school diploma 2011-2015. The percentage of each level of education at the county level was reported on the AHRF data (see Section A.3.5). This value was calculated by dividing the number of individuals aged 25 years or older with less than a high school diploma by the standard education level denominator provided on the AHRF then multiplying by 100. This county-level metric was then matched to each home health episode based on the county in which care was provided (see Section A.4.4.1 for a detailed description in how county was determined).

OASIS Clinical Factors

Inpatient discharge within 14 days. For OASIS-based episodes of care, inpatient discharge within 14 days prior to the start of care was derived from OASIS assessment item M1000. For claims-based episodes, each home health beneficiary's FFS status was determined using the MBSF monthly indicators for the 14 days prior to the start of the episode. Among those beneficiaries who are Parts A & B eligible, inpatient and SNF claims were scanned for those with a clm_thru_dt (i.e. discharge) occurring within the 14-day lookback period.

Receiving psychiatric nursing services. For OASIS-based episodes of care, an indicator variable indicating the reception of psychiatric nursing services was derived from OASIS assessment item M1750, in which a response of '01' indicates that the beneficiary was receiving psychiatric nursing services.

Risk for hospitalization. For OASIS-based episodes of care, three indicators for risk for hospitalization were derived from one of two OASIS assessment items, depending on assessment version. For assessments using the C version, item M1032 was used, and for assessments using the C1 and later versions, item M1033 was used. The response categories differed across the two OASIS versions. For C1 and later (M1033), responses of '01' were coded as having a history of falls, responses of '03' were coded as having multiple hospitalizations, and responses of '07' were coded as taking five or more medications. For (M1032), responses of '03' were coded as having a history of falls, responses of '02' were coded as having multiple hospitalizations, and responses of '04' were coded as taking five or more medications.

Requires urinary catheter. For OASIS-based episodes of care, indicators for urinary incontinence or catheter presence were populated only in instances in which the patient had been discharged from an inpatient community (via M1000) or received a diagnosis requiring medical or treatment regimen change (via M1016 for C1 assessments or M1017 if C2 assessments). Among those patients, the indicator was populated when item M1610 had a response of '02.'

Surgical wound. For OASIS-based episodes of care, an indicator variable indicating that the patient has a surgical wound was populated based on OASIS assessment item M1340 with a response of '01,' indicating that the patient has an observable surgical wound.

Non-surgical wound or skin lesion. For OASIS-based episodes of care, an indicator variable indicating that the patient has a skin lesion or open wound was populated based on OASIS assessment M1350 with a response of '01,' indicating that the patient has a lesion or open wound.

Acute Conditions. For OASIS-based episodes of care, acute conditions (need for oxygen therapy, orthopedic conditions, and presence of neoplasm diagnosis) were identified from a series of OASIS assessment items. The need for ***oxygen therapy*** was derived from item M1410 when the response was '01.' The presence of ***orthopedic conditions***, which encompasses a range of conditions including musculoskeletal conditions (e.g., sprain, cartilage tear, gout), was populated only in instances in which the patient had been discharged from an inpatient community (via M1000) or received a diagnosis requiring medical or treatment regimen change (via M1016 for C1 assessments or M1017 if C2 assessments). Among those cases, orthopedic conditions were derived from OASIS assessment items M1010 (for ICD9 codes from an inpatient diagnosis), M1011 (ICD10 codes from an inpatient diagnosis), M1016 (for ICD9 codes from a diagnosis requiring medical or treatment regimen change within the past 14 days), and M1017 (ICD10 codes from a diagnosis requiring medical or treatment regimen change). Those International Classification of Diseases (ICD) codes were then used to populate this indicator according to CMS documentation on OASIS measures.[14] Finally, we derived ***neoplasm diagnosis*** from a series of OASIS assessment items: M1020 (primary diagnosis ICD codes), M1022 (other ICD diagnosis codes), and M1024 (payment ICD diagnosis codes). These ICD codes were then used to indicate the presence of a diagnosis of neoplasm according to CMS documentation on OASIS measures.[14]

[14] Hittle DF, Nuccio EJ. (2017) Home Health Agency Patient-Related Characteristics Reports: Technical Documentation of Measures - Revision 4.1. Prepared for: Department of Health and Human Services; Centers for Medicare & Medicaid Services. *University of Colorado School of Medicine - Division of Health Care Policy and Research*.

Exhibit A-15. Pressure Ulcers

OASIS Item	OASIS Question	Variables	OASIS Response
M1308 (version C1), M1311 (version C2) – Pressure Ulcers	Current Number of Unhealed Pressure Ulcers at Each Stage (or Unstageable)	Pressure Ulcer Stage 2	A
		Pressure Ulcer Stage 3	B
		Pressure Ulcer Stage 4	C
		Pressure Ulcer Not Stageable	D.1-D.3

Source: OASIS-C2 Guidance Manual

Exhibit A-16. Ambulation/Locomotion

OASIS Item	OASIS Question	Variables	OASIS Response
M1860 – Ambulation/Locomotion	Current ability to walk safely, once in a standing position, or use a wheelchair, once in a seated position, on a variety of surfaces.	Able to independently walk with the use of a one-handed device	01
		Requires two handed device or human assistance	02
		Walks only with supervision or assistance from another at all times	03
		Chairfast to bedfast	04, 05, 06

Source: OASIS-C2 Guidance Manual

Exhibit A-17. Bed Transferring

OASIS Item	OASIS Question	Variables	OASIS Response
M1850 – Bed Transferring	Transferring: Current ability to move safely from bed to chair, or ability to turn and position self in bed if patient is bedfast	Able to transfer with minimal human assistance or with use of an assistive device	01
		Able to bear weight and pivot during the transfer but unable to transfer self	02
		Unable to transfer self and is unable to bear weight or pivot when transferred by another person	03
		Bedfast, unable to transfer but is able to turn and position self in bed	04
		Bedfast, unable to transfer and is unable to turn and position self	05

Source: OASIS-C2 Guidance Manual

Exhibit A-18. Bathing

OASIS Item	OASIS Question	Variables	OASIS Response
M1830 – Bathing	Bathing: Current ability to wash entire body safely. Excludes grooming (washing face, washing hands, and shampooing hair).	With the use of devices in shower/tub	01
		With intermittent assistance in shower/tub	02
		Participates with supervision in shower/tub	03
		Independent at sink, in chair, or on commode	04
		Participates with assist at sink, in chair, or commode	05
		Unable to participate; bathed totally by another	06

Source: OASIS-C2 Guidance Manual

Exhibit A-19. Pain

OASIS Item	OASIS Question	Variables	OASIS Response
M1242 – Pain	Frequency of pain interfering with patient's activity or movement	Pain does not interfere with activity	01
		Less often than daily pain	02
		Daily, but not constant pain	03
		Constant pain	04

Source: OASIS-C2 Guidance Manual

Exhibit A-20. Oral Medications

OASIS Item	OASIS Question	Variables	OASIS Response
M2020 – Oral Medications	Management of Oral Medications: Patient's current ability to prepare and take all oral medications reliably and safely, including administration of the correct dosage at the appropriate times/intervals. Excludes injectable and IV medications. (NOTE: This refers to ability, not compliance or willingness.)	Patient is able to take oral medications if prepared in advance/another person develops a drug diary	01
		Able to take medications at the correct time if given reminders by another person at the appropriate times	02
		Unable to take medication unless administered by another person	03

Source: OASIS-C2 Guidance Manual

Exhibit A-21. Dyspnea

OASIS Item	OASIS Question	Variables	OASIS Response
M1400 – Dyspnea	When is the patient dyspneic or noticeably short of breath?	Patient is short of breath only when walking more than 20 feet	01
		With moderate exertion	02
		With minimal exertion or at rest	03, 04

Source: OASIS-C2 Guidance Manual

Exhibit A-22. Wound Status

OASIS Item	OASIS Question	Variables	OASIS Response
M1342 – Wound Status	Status of Most Problematic Surgical Wound that is Observable	Fully granulating	01
		Early/partial granulation	02
		Not healing	03

Note: These indicators are only populated if M1340 = '00' or '02' (i.e., Does this patient have a surgical wound? 00 = No, 02 = Surgical wound known but observable due to non-removable dressing/device). | Source: OASIS-C2 Guidance Manual

A.2.1.2 Episode Characteristics

Episode Type. Home health claims-based episodes with outlier payment adjustments were identified using the variable claim value code = 17. Low Utilization Payment Adjustment (LUPA) payment adjustments were identified using the variable *CLM_HHA_LUPA_IND_CD*, and Partial Episode Payment (PEP) payment adjustments were identified using *PTNT_DSCHRG_STUS_CD = '06'.* Otherwise, all episodes without outlier, LUPA, or PEP adjustments were categorized as "Normal".

Episodes within a Sequence. Claims-based episode sequences were put together by combining episodes whose end date and start dates were within 60 days of one another; a gap of at least 60 days indicated the start of a new sequence. Three different categories of episodes were created depending on the order in which an episode appears relative to the larger sequence of episodes in which it occurs: first in a sequence, second in a sequence, and third or higher in a sequence. All episodes, regardless of episode type (i.e., normal, outlier, LUPA, PEP), were included. The logic we employed is in alignment with the methodology for determining home health stays for the two HHVBP claims-based measures.[19]

Visits in an Episode. Using the revenue center codes associated with each home health claim, visits per claims-based episode were counted for each type of home health service: physical therapy visit (revenue center code 042x), occupational therapy visit (revenue center code 043x), speech language pathology visit (revenue center code 044x), skilled nursing visit (revenue center code 055x), medical social services visit (revenue center code 056x), and home health aide visit (revenue center code 057x). These visits were then summed to calculate the total visits per claims-based episode.

Visits in an Episode by Type of Visit. Using the revenue center codes associated with each home health claim, visits per episode were counted for each type of home health service: physical therapy visit (revenue center code 042x), occupational therapy visit (revenue center code 043x), speech language

pathology visit (revenue center code 044x), skilled nursing visit (revenue center code 055x), medical social services visit (revenue center code 056x), and home health aide visit (revenue center 057x).

Hierarchical Condition Category (HCC) risk scores. To evaluate the risk level of beneficiaries at the start of each home health episode, we calculated episode-level HCC risk scores by using Research Identifiable Files (RIFs) claims data and software (Version 21, published in 2014 and 2019) provided by CMS.[15] For this analysis, we focused on the first episode in the sequence only. Specifically, for each first home health episode in a sequence, we looked back 365 days to include all diagnosis codes from Part B carrier, inpatient, and outpatient claims. Only professional carrier claims were eligible to be included based on Healthcare Common Procedure Coding System (HCPCS) codes provided by CMS.[16] We excluded any carrier claims for which line item Berenson-Eggers Type of Service (BETOS) code variable equals D1A, D1B, D1C, D1D, D1E, D1F, D1G (which is durable medical equipment [DME]), or O1A (which is ambulance services). The intent of the algorithm was to exclude claims where the services do not require a licensed health care professional. In addition, we also excluded any outpatient claims that only included lab testing, based on revenue center files.

The model software created 87 HCCs and three HCC scores: new enrollees, institutional and community. Beneficiaries were assigned to one of the three HCC scores as follows:

- If a beneficiary was not fully enrolled in Medicare FFS for the past 12 months before the start of the home health episode, the new enrollee score was used.
- Otherwise, if at least one 90-day assessment exists in the Minimum Data Set (MDS) within the 365 days prior to the start of the home health episode, the institutional score was used.
- Otherwise, the community score was used.

For second or later home health episodes in the sequence, the HCC score from first home health episode was used.

For beneficiaries with ESRD status at the start of the home health episode, we calculated an ESRD HCC risk score based on the Version 21 ESRD model software published by CMS.[15] ESRD status was defined as either having an unfailed kidney transplant at the start of home health episode or having a dialysis claim during the 365 days before the home health episode begins. Dialysis claims were defined as facility type code equal to 7 and service classification type equal to 2 (i.e. first 2 digits of type of bill equals to 72). Acute kidney injury (AKI) dialysis claims were excluded if HCPCS code equals to G0491 or claim related condition code equals to 84.

Similar to the HCC risk scores, we grouped the diagnosis code and calculated the Charlson Comorbidity Index (CCI) for each home health episode using the crosswalk provided by the National Institutes of Health (NIH) National Cancer Institute.[17]

[15] See CMS Risk Adjustment model software. Accessed from here.
[16] See CMS Medicare Risk Adjustment Eligible CPT/HCPCS Codes. Accessed from here.
[17] NIH National Cancer Institute, Comorbidity SAS Macro. Accessed from here.

A.2.1.3 HHA Characteristics

Total Number of HHAs. Home health claims and OASIS episodes of care were used to generate a list of all unique HHAs with at least one home health claim or OASIS episode of care in a specified time period.

Ownership. Using publicly available CMS Provider of Services (POS) data, HHAs were categorized as for-profit, non-profit, or government-owned, conditional on control type. From the provider data, control type is recoded as "non-profit" (control type codes 1,2,3), "for-profit" (control type code 4), and "government-owned" (control type codes 5,6,7).

Setting: Hospital-Based vs. Freestanding. Using publicly available CMS POS data, HHAs were categorized as freestanding or hospital-based conditional on facility type. From the provider data, facility type is recoded as "freestanding" (facility type codes 1,2,3,7) or "hospital-based" (facility type codes 4,5,6).

HHA Age. HHA age was calculated for each episode based on the floored (i.e., rounding down to nearest integer) year difference between HHA original participation date and the episode start date (for claims-based episodes) or end date (for OASIS-based episodes). Categorical variables were also created for HHA age at 0~3 years, 4~10 years, and more than 10 years.

Chain Membership. HHA chain membership was determined for each individual year from 2013-2018 using two sources: Provider Enrollment, Chain and Ownership System (PECOS) and HHA Cost Report data. Using Cost Report data, chain affiliation was determined using the information reported on Line 29 of Worksheet S-2 for a given fiscal year. Extraction of PECOS chain affiliation data are described in Section A.3.9 below. PECOS-based chain affiliation data were assessed for any year in which the HHA was enrolled in Medicare (via the PECOS enrollment parent table) at the end of the CY. If the HHA met this condition and was also under ownership of a chain at the end of the CY, then the HHA was considered to be affiliated with a chain for that year. If the HHA was enrolled in Medicare at the end of the CY and was not under ownership of a chain at the end of the CY, then the HHA was not considered to be affiliated with a chain for that year. If the HHA did not have PECOS enrollment data covering the end of the CY, then chain affiliation based on PECOS data was considered missing.

Using the processed Cost Reports and PECOS, an agency was assigned chain membership if either data source indicated chain membership for the given year. If both sources indicated that the agency was not a chain, or if one source indicated not a chain and the other was missing, then the agency was assigned a non-chain status. If both sources were missing, then the prior year and following year were checked, and if the agency had the same status before and after, that status was assigned (e.g., if an HHA is chain in 2013, missing in 2014, and chain in 2015, their 2014 status would be set to "chain").

For this report, we only updated an HHA's chain affiliation indicator for CY 2018 based on updated cost report and PECOS data, as of July 2019; therefore, the chain affiliation indicator for an HHA in each of the years from 2013 through 2017 has been held constant from the previous Annual Report. We made this decision in order to mitigate the impact of inaccurate changes to historic provider enrollment and chain affiliation data that are introduced in sequential updates to the PECOS data, which we describe in further detail in Section A.3.9.

HHA Size. HHA size was determined at an annual level by counting the number of OASIS episodes of care that end within a given year. Agencies were then further grouped into mutually exclusive categories based on the number of episodes they provided:

- 1-59 episodes
- 60-249 episodes
- 250-499 episodes
- 500-999 episodes
- 1000+ episodes

Profitability. Profitability measures the Medicare profit margin for agencies. The measure was defined as the difference between total Medicare payments for prospective payment system episodes and the total costs of Medicare services, including drugs and DME, divided by total Medicare payments for prospective payment system episodes, (payments – costs)/payments. Medicare payments and costs were taken from Medicare HHA and Hospital Cost Reports for freestanding and hospital-based agencies, respectively. Because cost reports may contain missing or extreme values, CMS, MedPAC, and others commonly trim the population of home health cost reports for statistical analysis. We utilized a trimming methodology previously employed by CMS to account for extreme values.[18] Given differences in cost structure and cost reporting between HHAs in freestanding and hospital settings, we restricted the trimmed sample used for our analysis to freestanding HHAs, which represent the vast majority of HHAs in HHVBP states. To control for extreme values within our trimmed sample, we categorized freestanding home health agencies based on their reported profit margins and use the median, rather than the mean, as a measure of central tendency.

[18] Abt Associates. (2013) Analyses in Support of Rebasing & Updating Medicare Home Health Payment Rates; Prepared for the Centers for Medicare and Medicaid Services. Accessed from here.

A.2.2 Claims-Based Impact Measures

This section presents how the claims-based measures were created. Of note, the bottom row of each table notes the data source(s) used to create the impact measure. Each of the impact measures, episode-level numerator and denominator indicators were merged with other variables to create the analytic file (Sections A.4.2 and A.4.4) that was used to conduct the analyses and produce the results presented in the report.

Exhibit A-23. Average Number of FFS HH Episodes per 1,000 FFS Beneficiaries

Measure Concept	Definition
Measure Category	Quality
Measure Description	Number of claims-based HH episodes ending in a given year per 1,000 FFS beneficiaries alive at the beginning of the year.
Measure Numerator	Total number of claims-based HH episodes ending in the year.
Numerator Details	Numerator includes all claims-based HH episodes of all types (LUPAs, outliers, PEPs, etc.) irrespective of whether they are first, second, or higher in the sequence, ending in a given year.
Measure Denominator	Total number of Medicare-eligible FFS beneficiaries alive at the beginning of the given year divided by 1,000.
Denominator Details	Total number of Medicare-eligible FFS beneficiaries alive at the beginning of the year (e.g., if a beneficiary is no longer FFS next month, they are still included) is obtained and then the number is divided by 1,000.
Data Sources	MBSF, HHA Claims

Exhibit A-24. Percent of FFS Beneficiaries with at least one HH Episode

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percent of Medicare-eligible FFS beneficiaries with at least one claims-based HH episode in a given year indicating the beneficiary used HH services.
Measure Numerator	Total number of claims-based HH episodes ending in the year.
Numerator Details	Total number of Medicare-eligible FFS beneficiaries with at least one claims-based HH episode ending in a given year.
Measure Denominator	Total number of Medicare-eligible FFS beneficiaries alive at the beginning of the given year.
Denominator Details	Total number of Medicare-eligible FFS beneficiaries alive at the beginning of the year (e.g., if a beneficiary is no longer FFS next month, they are still included).
Data Sources	MBSF, HHA Claims

Exhibit A-25. Average Medicare Spending per Day for Unplanned Acute Care Hospitalizations among All FFS Home Health Episodes (%)

Measure Concept	Definition
Measure Category	Spending
Measure Description	Medicare payments per day for all unplanned ACHs within 60 days of the start of the HH episode or until the start of the next eligible HH episode that begins on or before the 60th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Measure Numerator	Total Medicare payments associated with all unplanned ACHs within 60 days of the start of the HH episode and prior to the start of the next eligible HH episode that begins on or before the 60th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Numerator Details	▪ Total Medicare payments associated with the entire unplanned ACH are included if the ACH occurs within 60 days of the start of the HH episode and prior to the start of the next eligible HH episode that begins on or before the 60th day or until death or loss of FFS Part A eligibility; whichever comes earlier. ▪ Inpatient claims that completely overlap (i.e., claim through date of first claim is greater than claim from date of ensuing claim) are combined in terms of expense and duration. Further, in the case of two consecutive acute care hospital claims for which the later claim begins on the same or next day of the prior claim's end date, the following logic is applied: if the provider on each claim is different, then combine the claims into one hospital stay in which the patient transferred hospitals; if the provider on each claim is the same, then maintain the two separate stays and consider the second claim to be a re-admission due to a potentially different diagnosis. ▪ If there are multiple distinct eligible claims associated with a single HH episode then the costs associated with all of them are included. ▪ Planned hospitalizations (defined by a list of Agency for Healthcare Research and Quality [AHRQ] Procedure and Condition Clinical Classifications Software [CCS] and additional ICD-9-CM procedure codes) are excluded from the measure numerator. ▪ The measure specifications, including the AHRQ codes, were pulled from the CMS Home Health Claims-Based Utilization Measures Specifications.[19]
Measure Denominator	Total number of eligible days accrued from periods of up to 60 days following the start date of HH FFS episodes starting in a given calendar quarter.
Denominator Details	All HH episodes that start in the quarter are included with the following exclusions: ▪ HH episodes for patients who are alive and are not continuously enrolled in FFS Medicare for the 60 days following the start of the HH episode. ▪ HH episodes for patients who were not FFS eligible in the six months prior. ▪ HH episodes that begin with a LUPA claim. ▪ HH episodes in which the patient receives service from multiple agencies during the 60-day window (see "Transfer HHAs within 60 days" in Glossary [Section A.6]).
Data Sources	MBSF, HHA Claims, Inpatient Claims. Enrollment status and beneficiary death date are obtained from MBSF.

This measure was capped both at lower and upper ends to reduce the influence of extreme expenditure outliers. For each year, the measure was capped at the 99th percentile of the unweighted positive (i.e., payment values > 0) spending per-day measure (i.e. any value greater than 99th percentile were set to the 99th percentile value), and any negative payment values were set to zero dollars.

[19] See CMS Specifications for Claims-Based Utilization Measures.

Exhibit A-26. Average Medicare Spending per Day during and following FFS Home Health Episodes of Care

Measure Concept	Definition
Measure Category	Spending
Measure Description	Average Medicare Part A and Part B payments (or "Expenditure Components" listed below) per day during and up to 37 days following HH episodes of care. This measure includes payments that occur between the start of the HH episode (start of care [SOC]) and a 37-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 37th day. The length of the look-out period (37-day) is composed of 7 days post last HH visit and additional 30 days thereafter or until the start of the next HH episode that begins on or before the 37th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Measure Numerator	Total Medicare Part A and Part B payments (or "Expenditure Components" listed below) between the SOC and a 37-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 37th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Numerator Details	Sum of Medicare payments on all Part A and Part B claims (or "Expenditure Components" listed below) with a claim start date (i.e., based on "clm_from_dt") occurring between the SOC and a 37-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 37th day or until death or loss of FFS Part A eligibility; whichever comes earlier. Where applicable, the 37-day look-out period following the end of care is truncated to prevent possible double counting of payments for claims that occur during a subsequent HH episode beginning during this 37-day period.
Measure Denominator	Total number of eligible days accrued during and in periods of up to 37 days following the last HH visit date of all HH FFS episodes starting in a given calendar quarter.
Denominator Details	Denominator includes all days occurring between the SOC and a 37-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 37th day or until death or loss of FFS Part A eligibility, for HH episodes of all types (LUPAs, outliers, PEPs, etc.) starting in a given calendar quarter, irrespective of whether they are first, second, or higher episodes in a sequence. HH episodes are excluded in the absence of a HH visit date. The maximum number of days that can be included in the denominator is 97 days for a 60 day episode of care (60 + 37 days), unless the last HH visit date occurs before the HH episode claim end date and/or a subsequent HH episode, death, or loss of FFS Part A eligibility occurs prior to the end of the 37-day look–out period.
Expenditure Components	Besides the total Medicare Part A and Part B spending measure, we repeated the same calculation for each individual expenditure component, including: Medicare Part B carrier, DME, Medicare Part B carrier and DME combined, HH, Hospice, Inpatient, Outpatient Emergency Department, Outpatient Non-Emergency Department, Outpatient, and SNF and obtained average Medicare spending per day during and following FFS home health episodes of care for each of the expenditure components.
Data Sources	Medicare Part B carrier, DME, HH, Hospice, Inpatient, Outpatient, and SNF claims.

This measure along with each of the components were individually capped at both the lower and upper ends to reduce the influence of extreme expenditure outliers. For each year, the measure was capped at the 99th percentile of the unweighted spending per-day measure (i.e. any values greater than 99th percentile were set to the 99th percentile value), and any negative payment values were set to zero dollars.

Exhibit A-27. Average Medicare Spending per Day during FFS Home Health Episodes of Care

Measure Concept	Definition
Measure Category	Spending
Measure Description	Average Medicare Part A and Part B payments (or "Expenditure Components" listed below) per day during HH episodes of care. This measure includes payments that occur between the SOC and a 7-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 7th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Measure Numerator	Total Medicare Part A and Part B payments (or "Expenditure Components" listed below) between the SOC and a 7-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 7th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Numerator Details	Sum of Medicare payments on all Part A and Part B claims (or "Expenditure Components" listed below) with a claim start date (i.e., based on "clm_from_dt") occurring between the SOC and a 7-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 7th day or until death or loss of FFS Part A eligibility; whichever comes earlier. Where applicable, the 7-day look-out period following the end of care is truncated to prevent possible double counting of payments for claims that occur during a subsequent HH episode beginning during this 7-day period.
Measure Denominator	Total number of eligible days accrued from all HH FFS episodes starting in a given calendar quarter.
Denominator Details	Denominator includes all days occurring between the SOC and a 7-day look-out period following the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 7th day or until death or loss of FFS Part A eligibility, for HH episodes of all types (LUPAs, outliers, PEPs, etc.) starting in a given calendar quarter, irrespective of whether they are first, second, or higher episodes in a sequence. HH episodes are excluded in the absence of a HH visit date. The maximum number of days that can be included in the denominator is 67 days for a 60 day episode of care (60 + 7 days), unless the last HH visit date occurs before the HH episode claim end date and/or a subsequent HH episode, death, or loss of FFS Part A eligibility occurs prior to the end of the 7-day look–out period.
Expenditure Components	Besides the total Medicare Part A and Part B spending measure, we repeated the same calculation for each individual expenditure component, including: Medicare Part B carrier, DME, Medicare Part B carrier and DME combined, HH, Hospice, Inpatient, Outpatient Emergency Department, Outpatient Non-Emergency Department, Outpatient, and SNF and obtained average Medicare spending per day during FFS home health episodes of care for each of the expenditure components.
Data Sources	Medicare Part B carrier, DME, HH, Hospice, Inpatient, Outpatient, and SNF claims.

This measure along with each of the components were individually capped at both the lower and upper ends to reduce the influence of extreme expenditure outliers. For each year, the measure was capped at the 99th percentile of the unweighted spending per-day measure (i.e. any values greater than 99th percentile were set to the 99th percentile value), and any negative payment values were set to zero dollars.

Exhibit A-28. Average Medicare Spending per Day following FFS Home Health Episodes of Care

Measure Concept	Definition
Measure Category	Spending
Measure Description	Average Medicare Part A and Part B payments (or "Expenditure Components" listed below) per day that occur after the 7th day following the last HH visit (end of care) and over the subsequent 30 days or until the start of the next HH episode that begins on or before the 30th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Measure Numerator	Total Medicare Part A and Part B payments (or "Expenditure Components" listed below) within 30 days following the 7th day after the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 30th day or until death or loss of FFS Part A eligibility; whichever comes earlier.
Numerator Details	Sum of Medicare payments on all Part A and Part B claims (or "Expenditure Components" listed below) with a claim start date (i.e., based on "clm_from_dt") occurring within 30 days following the 7th day after the last HH visit (end of care) or until the start of the next HH episode that begins on or before the 30th day or until death or loss of FFS Part A eligibility; whichever comes earlier. Where applicable, the 30-day downstream period is truncated to prevent possible double counting of payments for claims that occur during a subsequent HH episode beginning during this 30-day period.
Measure Denominator	Total number of eligible days accrued from periods of up to 30 days that occur after the 7th day following the last HH visit date of HH FFS episodes starting in a given calendar quarter.
Denominator Details	Denominator includes all days accrued from periods following the 7th day after the last HH visit date, for HH episodes of all types (LUPAs, outliers, PEPs, etc.) starting in a given calendar quarter, irrespective of whether they are first, second, or higher episodes in a sequence. HH episodes are excluded if: 1. There are no HH visit dates reported. 2. A measurement time period is not available since the claim start date ("clm_from_dt") on a subsequent HH episode, date of death, or loss of FFS Part A eligibility does not exceed the last HH visit date of the HH episode by more than 1 day. The maximum number of days that can be included in the denominator is 30 days, unless a subsequent HH episode, death, or loss of FFS Part A eligibility occurs prior to the end of the 30-day downstream period.
Expenditure Components	Besides the total Medicare Part A and Part B spending measure, we repeated the same calculation for each individual expenditure component, including: Medicare Part B carrier, DME, Medicare Part B carrier and DME combined, Hospice, Inpatient, Outpatient Emergency Department, Outpatient Non-Emergency Department, Outpatient, and SNF and obtained average Medicare spending per day following FFS home health episodes of care for each of the expenditure components.
Data Sources	Medicare Part B carrier, DME, Hospice, Inpatient, Outpatient, and SNF claims.

This measure along with each of the components were individually capped at both the lower and upper ends to reduce the influence of extreme expenditure outliers. For each year, the measure was capped at the 99th percentile of the unweighted spending per-day measure (i.e. any value greater than 99th percentile were set to the 99th percentile value), and any negative payment values were set to zero dollars.

Exhibit A-29. Emergency Department Use (no Hospitalization)/First FFS Home Health Episodes

This impact measure is similar to the HHVBP measure, "Emergency Department Use without Hospitalization".[20] However, unlike the HHVBP measure, it is not risk adjusted.

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percentage of HH stays in which patients used the ED but were not admitted to the hospital during the 60 days following the start of the HH stay.
Measure Numerator	Number of HH stays for patients who have a Medicare claim for outpatient ED use and no claims for ACH in the 60 days following the start of the HH stay.
Numerator Details	The 60 day time window is calculated by adding 60 days to the "from" date in the first HH claim in the series of HH claims that comprise the HH stay. If the patient has any Medicare outpatient claims with any emergency room revenue center codes (0450-0459, 0981) during the 60 day window AND if the patient has no Medicare inpatient claims for admission to an acute care hospital (identified by the CMS Certification Number [CCN] on the inpatient claim ending in 0001-0879, 0800-0899, or 1300-1399) during the 60 day window, then the stay is included in the measure numerator.
Measure Denominator	Number of HH stays that begin during the 12-month observation period. A HH stay is a sequence of HH payment episodes separated from other HH payment episodes by at least 60 days.
Denominator Details	See below for exclusions about HH stay construction. 1. HH stays for patients who are not continuously enrolled in Medicare FFS for the 60 days following the start of the HH stay or until death. 2. HH stays that begin with a LUPA claim. 3. HH stays in which the patient receives service from multiple agencies during the first 60 days. 4. HH stays for patients who are not continuously enrolled in Medicare FFS for the 6 months prior to the HH stay.
Data Sources	Claims Predicted Probability file

[20] See CMS Specifications for Home Health Claims-Based Utilization Measures, "Emergency Department Use without Hospitalization."

Exhibit A-30. Unplanned Acute Care Hospitalization/First FFS Home Health Episodes

This impact measure is similar to the HHVBP measure, "Acute Care Hospitalization". [21] However, unlike the HHVBP measure, it is not risk adjusted.

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percentage of HH stays in which patients were admitted to an acute care hospital during the 60 days following the start of the HH stay.
Measure Numerator	Number of HH stays for patients who have a Medicare claim for an admission to an acute care hospital in the 60 days following the start of the HH stay.
Numerator Details	The 60 day time window is calculated by adding 60 days to the "from" date in the first HH claim in the series of HH claims that comprise the HH stay. If the patient has at least one Medicare inpatient claim from short term or critical access hospitals (identified by the CCN on the inpatient claim ending in 0001-0879, 0800-0899, or 1300-1399) during the 60 day window, then the stay is included in the measure numerator. Note that planned hospitalizations are excluded from the numerator.
Measure Denominator	Number of HH stays that begin during the 12-month observation period. A HH stay is a sequence of HH payment episodes separated from other HH payment episodes by at least 60 days.
Denominator Details	1. HH stays for patients who are not continuously enrolled in Medicare FFS for the 60 days following the start of the HH stay or until death. 2. HH stays that begin with a LUPA claim. 3. HH stays in which the patient receives service from multiple agencies during the first 60 days. 4. HH stays for patients who are not continuously enrolled in Medicare FFS for the 6 months prior to the HH stay.
Data Sources	Claims Predicted Probability file

[21] See CMS Specifications for Home Health Claims-Based Utilization Measures, "Acute Care Hospitalization."

Exhibit A-31. Unplanned Acute Care Hospitalization/All FFS Home Health Episodes

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percentage of HH episodes with at least one unplanned admission to an acute care hospital within 60 days of the start of the episode or until the start of the next HH episode that begins on or before the 60th day.
Measure Numerator	Number of HH episodes with at least one unplanned admission to an acute care hospital within 60 days of the start of the episode or until the start of the next HH episode that begins on or before the 60th day.
Numerator Details	▪ The 60-day time window is calculated by adding 59 days to the "from" date of the HH episode. If a subsequent HH episode starts on or before the 60th day, the time window is ended early on the day prior to the start of the next episode. ▪ ACH occurs (and the HH episode is included in the numerator) if the patient has at least one Medicare inpatient claim from short-stay or critical access hospitals during the 60-day window. ▪ Planned hospitalizations (defined by a list of AHRQ Procedure and Condition CCS and additional ICD-9-CM procedure codes) are excluded from the measure numerator. The measure specifications, including the AHRQ codes, were pulled from the CMS Home Health Claims-Based Utilization Measures Specifications.[19]
Measure Denominator	Total number of eligible HH episodes starting in a given quarter.
Denominator Details	All HH episodes that start in the quarter are included with the following exclusions: ▪ HH episodes for patients who are alive and are not continuously enrolled in FFS Medicare for the 60 days following the start of the HH episode. ▪ HH episodes for patients who were not FFS eligible in the six months prior. ▪ HH episodes that begin with a LUPA claim. ▪ HH episodes in which the patient receives service from multiple agencies during the 60-day window (see "Transfer HHAs within 60 days" in Glossary [Section A.6]).
Data Sources	MBSF, HHA Claims, Inpatient Claims. Enrollment status and beneficiary death date are obtained from MBSF.

Exhibit A-32. Unplanned Hospital Readmission during First 30 Days of HH Care

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percentage of HH stays that started within five days of discharge from an acute care hospital with at least one Medicare ACH claim during the 30 days following the start of the HH stay.
Measure Numerator	Number of HH stays for patients who have a Medicare claim for unplanned inpatient stay in an acute care hospital in the 30 days following the start of the HH stay.
Numerator Details	The 30-day time window is calculated by adding 30 days to the "from" date in the first HH claim in the series of HH claims that comprise the HH stay. If the patient has at least one Medicare inpatient claim from short-term or critical access hospitals during the 30 day window (identified by the CCN on the inpatient claim ending in 001-0879, 0880-0899, or 1300-1399) then the stay is included in the measure numerator.
Measure Denominator	Number HH stays that begin during the 12-month observation period and prior to which patients who were discharged from an acute inpatient hospital within *five* days of the start of home care. A HH stay is a sequence of HH payment episodes separated from other HH payment episodes by at least 60 days.
Denominator Details	See below for exclusions about HH stay construction. 1. HH stays for patients who are not continuously enrolled in FFS 30 days following the start of the HH stay or until death. 2. HH stays that begin with a LUPA claim. 3. HH stays in which the patient receives service from multiple HHAs during the first 30 days. 4. HH stays for patients who are not continuously enrolled in Medicare FFS for the 6 months prior to the HH stay. 5. HH stays for admissions for the medical treatment of cancer, primary psychiatric diseases, rehabilitation care and the fitting of prostheses and adjustment devices, and admissions ending in patient discharge against medical advice. 6. HH stays for patients who receive intervening care in the window between the index hospital discharge and the start of HH care. 7. HH stays with missing payment-episode authorization strings.
Data Sources	Claims Predicted Probability file

Exhibit A-33. Emergency Department Use Following Hospitalization (without Hospital Readmission) in the First 30 days of Home Health Care

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percentage of HH stays that started within five days of discharge from an acute care hospital in which patients used the ED but were not admitted to the hospital during the 30 days following the start of the HH stay.
Measure Numerator	Number of HH stays for patients who have a Medicare claim for outpatient emergency use and no claims for ACH in the 30 days following the start of the HH stay.
Numerator Details	The 30-day time window is calculated by adding 30 days to the "from" date in the first HH claim in the series of HH claims that comprise the HH stay. If the patient has any Medicare outpatient claims with any emergency room revenue center codes (0450-0459, 0981) during the 30 day window AND if the patient has no Medicare inpatient claims for admission to an ACH (identified by the CCN on the inpatient claim ending in 0001-0879, 0800-0899, or 1300-1399) during the 30 day window, then the stay is included in the measure numerator.
Measure Denominator	Number HH stays that begin during the 12-month observation period and prior to which patients who were discharged from an acute inpatient hospital within *five* days of the start of home care. A HH stay is a sequence of HH payment episodes separated from other HH payment episodes by at least 60 days.
Denominator Details	See below for exclusions about HH stay construction. 1. HH stays for patients who are not continuously enrolled in Medicare FFS 30 days following the start of the HH stay or until death. 2. HH stays that begin with a LUPA claim. 3. HH stays in which the patient receives service from multiple HHAs during the first 30 days. 4. HH stays for patients who are not continuously enrolled in Medicare FFS for the 6 months prior to the HH stay. 5. HH stays for admissions for the medical treatment of cancer, primary psychiatric diseases, rehabilitation care and the fitting of prostheses and adjustment devices, and admissions ending in patient discharge against medical advice. 6. HH stays for patients who receive intervening care in the window between the index hospital discharge and the start of HH care. 7. HH stays with missing payment-episode authorization strings.
Data Sources	Claims Predicted Probability file

Exhibit A-34. Skilled Nursing Facility Use/All FFS HH Episodes

Measure Concept	Definition
Measure Category	Quality
Measure Description	Percentage of HH episodes with at least one admission to a SNF within 60 days of the start of the HH episode or until the start of the next HH episode that begins on or before the 60th day.
Measure Numerator	Number of HH episodes with at least one admission to a SNF within 60 days of the start of the HH episode or until the start of the next HH episode that begins on or before the 60th day.
Numerator Details	▪ The 60-day time window is calculated by adding 59 days to the "from" date of the HH episode. If a subsequent HH episode starts on or before the 60th day, the time window is ended early on the day prior to the start of the next episode. ▪ The SNF admission is counted if the patient has at least one SNF claim during the 60-day window. ▪ SNF admissions following planned ACH (defined by a list of AHRQ Procedure and Condition CCS and additional ICD-9-CM procedure codes) are excluded from the measure numerator under the following conditions: 1. The planned hospitalization starts within the HH episode 60-day window. 2. The planned hospitalization ends within the HH episode 60-day window. 3. The SNF stay starts within the HH episode 60-day window. 4. The SNF stay starts on or after the planned hospitalization end date.
Measure Denominator	Total number of eligible HH episodes starting in a given quarter.
Denominator Details	All HH episodes that start in the quarter are included with the following exclusions: ▪ HH episodes for patients who are alive and are not continuously enrolled in FFS Medicare for the 60 days following the start of the HH episode. ▪ HH episodes for patients who were not FFS eligible in the six months prior. HH episodes that begin with a LUPA claim. HH episodes in which the patient receives service from multiple agencies during the 60-day window (see "Transfer HHAs within 60 days" in Glossary [[Section A.6]).
Data Sources	HHA Claims, SNF Claims, MBSF, Inpatient RIF. Enrollment status is identified using the Medicare Enrollment Database.

A.2.3 OASIS-Based Outcome Impact Measures

This section presents information on the OASIS-based outcome impact measures analyzed in this report. Of note, the measure values were included as part of our Quality Improvement and Evaluation System (QIES) extract (see Section A.3.6.2); no additional measure calculations were necessary. The tables below summarize the measure definitions, as defined by CMS.[22]

Exhibit A-35. Discharged to Community

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH episodes after which patients remained at home.
Measure Numerator	Number of HH episodes where the assessment completed at the discharge indicates the patient remained in the community after discharge.
Measure Denominator	Number of HH quality episodes ending with a discharge or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes that end in patient death.

Source: CMS OASIS-C2 Home Health Outcome Measures

Exhibit A-36. Improvement in Ambulation-Locomotion

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH quality episodes during which the patient improved in ability to ambulate.
Measure Numerator	Number of HH quality episodes where the value recorded on the discharge assessment indicates less impairment in ambulation/locomotion at discharge than at Start or Resumption of Care (SOC/ROC).
Measure Denominator	Number of HH quality episodes ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient, at SOC/ROC, was able to ambulate independently, episodes that end with inpatient facility transfer or death, or patient is nonresponsive.

Source: CMS OASIS-C2 Home Health Outcome Measures

[22] See CMS OASIS-C2 Home Health Outcome Measures.

Exhibit A-37. Improvement in Bathing

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH episodes of care during which the patient got better at bathing self.
Measure Numerator	Number of HH episodes of care where the value recorded on the discharge assessment indicates less impairment in bathing at discharge than at SOC/ROC.
Measure Denominator	Number of HH episodes of care ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH episodes of care for which the patient, at SOC/ROC, was able to bath self independently, episodes that end with inpatient facility transfer or death, or patient is nonresponsive.

Source: CMS OASIS-C2 Home Health Outcome Measures

Exhibit A-38. Improvement in Bed Transferring

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH quality episodes during which the patient improved in ability to get in and out of bed.
Measure Numerator	Number of HH quality episodes where the value recorded on the discharge assessment indicates less impairment in bed transferring at discharge than at SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient, at SOC/ROC, was able to transfer independently, episodes that end with inpatient facility transfer or death, or patient is nonresponsive.

Source: CMS OASIS-C2 Home Health Outcome Measures

Exhibit A-39. Improvement in Dyspnea

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH quality episodes during which the patient became less short of breath or dyspneic.
Measure Numerator	Number of HH quality episodes where the discharge assessment indicates less dyspnea at discharge than at SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient, at SOC/ROC, was not short of breath at any time, or episodes that end with inpatient facility transfer or death.

Source: CMS OASIS-C2 Home Health Outcome Measures

Exhibit A-40. Improvement in Management of Oral Medications

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH quality episodes during which the patient improved in ability to take their medicines correctly (by mouth).
Measure Numerator	Number of HH quality episodes where the value recorded on the discharge assessment indicates less impairment in taking oral medications correctly at discharge than at SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient, at SOC/ROC, was able to take oral medications correctly without assistance or supervision, episodes that end with inpatient facility transfer or death, patient is nonresponsive, or patient has no oral medications prescribed.

Source: CMS OASIS-C2 Home Health Outcome Measures

Exhibit A-41. Improvement in Pain Interfering with Activity

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH quality episodes during which the patient's frequency of pain when moving around improved.
Measure Numerator	Number of HH quality episodes where the value recorded on the discharge assessment indicates less frequent pain at discharge than at SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient, at SOC/ROC, had no pain reported, episodes that end with inpatient facility transfer or death, or patient is nonresponsive.

Source: CMS OASIS-C2 Home Health Outcome Measures

Exhibit A-42. Improvement in Status of Surgical Wounds

Measure Concept	Definition
Measure Category	OASIS Outcome
Measure Description	Percentage of HH quality episodes during which the patient demonstrates an improvement in the condition of surgical wounds.
Measure Numerator	Number of HH quality episodes where the patient has a better status of surgical wounds at discharge compared to SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with a discharge during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient, at SOC/ROC, did not have any surgical wounds or had only a surgical wound that was unobservable or fully epithelialized, or episodes that end with inpatient facility transfer or death.

Source: CMS OASIS-C2 Home Health Outcome Measures

A.2.4 OASIS-Based Process Impact Measures

This section presents information on the OASIS-based process impact measures analyzed in the report. Of note, the measure values were included as part of our QIES extract (see Section A.3.6.2); no additional measure calculations were necessary. The tables below summarize the measure definitions, as defined by CMS.[23]

Exhibit A-43. Influenza Immunization Received for Current Flu Season

Measure Concept	Definition
Measure Category	OASIS Process
Measure Description	Percentage of HH quality episodes during which patients received influenza immunization for the current flu season.
Measure Numerator	Number of HH quality episodes during which the patient: a) received vaccination from the HHA; b) had received vaccination from HHA during earlier episode of care; or c) was determined to have received vaccination from another provider.
Measure Denominator	Number of HH quality episodes ending with a discharge or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which no care was provided during October 1–March 31, the patient died, or the patient did not meet age/condition guidelines for influenza vaccine.

Source: CMS OASIS-C2 Home Health Process Measures.

Exhibit A-44. Pneumococcal Polysaccharide Vaccine Ever Received

Measure Concept	Definition
Measure Category	OASIS Process
Measure Description	Percentage of HH quality episodes during which patients were determined to have ever received Pneumococcal Polysaccharide Vaccine.
Measure Numerator	Number of HH quality episodes during which patients were determined to have ever received Pneumococcal Polysaccharide Vaccine.
Measure Denominator	Number of HH quality episodes ending with a discharge or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes during which patient died, or patient did not meet age/condition guidelines for Pneumococcal Polysaccharide Vaccine.

Source: CMS OASIS-C2 Home Health Process Measures.

Exhibit A-45. Depression Assessment Conducted

Measure Concept	Definition
Measure Category	OASIS Process
Measure Description	Percentage of HH quality episodes in which patients were screened for depression (using a standardized depression screening tool) at SOC/ROC.
Measure Numerator	Number of HH quality episodes in which patients were screened for depression (using a standardized depression screening tool) at SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with discharge, death, or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient is nonresponsive.

Source: CMS OASIS-C2 Home Health Process Measures.

[23] See CMS OASIS-C2 Home Health Process Measures.

Exhibit A-46. Diabetic Foot Care and Patient/Caregiver Education Implemented during All Episodes of Care

Measure Concept	Definition
Measure Category	OASIS Process
Measure Description	Percentage of HH quality episodes in which diabetic foot care and patient/caregiver education were included in the physician-ordered plan of care and implemented (at the time of or at any time since the most recent SOC/ROC assessment).
Measure Numerator	Number HH quality episodes during which diabetic foot care and patient/caregiver education were included in the physician-ordered plan of care and implemented (at the time of or at any time since the most recent SOC/ROC assessment).
Measure Denominator	Number of HH quality episodes ending with a discharge or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the discharge/transfer assessment indicates the patient is not diabetic or is a bilateral amputee, OR patient died.

Source: CMS OASIS-C2 Home Health Process Measures.

Exhibit A-47. Multifactor Fall Risk Assessment Conducted for All Patients who can Ambulate

Measure Concept	Definition
Measure Category	OASIS Process
Measure Description	Percentage of HH quality episodes in which patients had a multi-factor fall risk assessment at SOC/ROC.
Measure Numerator	Number of HH quality episodes in which patients had a multi-factor fall risk assessment at SOC/ROC.
Measure Denominator	Number of HH quality episodes ending with discharge, death, or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	HH quality episodes for which the patient is bed-fast or chair-fast.

Source: CMS OASIS-C2 Home Health Process Measures.

Exhibit A-48. Timely Initiation of Care

Measure Concept	Definition
Measure Category	OASIS Process
Measure Description	Percentage of HH quality episodes in which the SOC/ROC date was either on the physician-specified date or within 2 days of the referral date or inpatient discharge date, whichever is later.
Measure Numerator	Number of HH quality episodes in which the SOC/ROC date was either on the physician-specified date or within 2 days of the referral date or inpatient discharge date, whichever is later. For a ROC, per the Medicare Conditions of Participation, the patient must be seen within 2 days of inpatient discharge, even if the physician specifies a later date.
Measure Denominator	Number of HH quality episodes ending with discharge, death, or transfer to inpatient facility during the reporting period, other than those covered by generic or measure-specific exclusions.
Measure-Specific Exclusions	None.

Source: CMS OASIS-C2 Home Health Process Measures.

A.2.5 HHCAHPS-Based Impact Measures

For the five HHVBP performance measures that address beneficiary experience, we used the publicly available, HHA-level HHCAHPS data for CYs 2013 – 2017. To receive the annual Home Health Prospective Payment System payment update, HHAs that do not qualify for an exemption from participating in the HHCAHPS Survey must contract with an approved HHCAHPS Survey vendor, administer the survey on an ongoing (monthly) basis, and submit HHCAHPS Survey data to the HHCAHPS Data Center on a quarterly basis. Agencies are exempted if they serve 59 or fewer survey-eligible patients a year. Survey-eligible patients are those who are at least 18 years old and have their skilled care covered by Medicare or Medicaid.[24]

The five measures—constructed from 19 HHCAHPS questions—are summarized below.[25]

1. **Care of patients** reflects "patients who reported that their home health team gave care in a professional way."[25] This composite measure is comprised of four HHCAHPS questions that address how frequently the HHA treated the patient gently, with courtesy and respect, how frequently the HHA seemed informed and up-to-date, and if the patient had any problems with the care received.
2. **Communication between providers and patients** reflects "patients who reported that their home health team communicated well with them."[25] This composite measure is comprised of six HHCAHPS questions related to different aspects of communication, including how frequently the HHA explained things in an easy to understand manner, listened carefully, and kept the patient informed about when staff would arrive.
3. **Specific care issues** reflect "patients who reported that their home health team discussed medicines, pain, and home safety with them."[25] This composite measure is comprised of seven HHCAHPS questions related to these three areas of care (that is, medicines, pain, and home safety).
4. **Rating of care provided by the agency** is a global rating measure that reflects the percentage of respondents who gave a rating of 9 or 10 to the question, "Using any number from 0–10, where 0 is the worst home health care possible, and 10 is the best home health care possible, what number would you use to rate your care from this agency's home health providers?"[25]
5. **Willingness to recommend the agency to friends and family** is a global rating measure that reflects the percentage of respondents who answered "Definitely Yes" to the question, "Would you recommend this agency to your family and friends if they needed home health care?"[25]

A.2.6 Measures Related to Entry/Exit

These two measures are reported through Quarter 2 of 2018 due to a lag in the reporting of POS data (see Section A.3.4 for details).

[24] Additional criteria are available here.
[25] Additional information on measure construction is available here.

Exhibit A-49. Entering Home Health Agencies, Percent

Measure Concept	Definition
Measure Category	HHA Entry and Exit
Measure Description	Percentage of open HHAs that are new in a given quarter.
Measure Numerator	Count of HHAs with an original Medicare participation date occurring in a given quarter.
Numerator Details	N/A
Measure Denominator	Total number of open HHAs of the given quarter.
Denominator Details	Excluding HHAs located in DC or any U.S. territory.
Data Sources	POS

Exhibit A-50. Exiting Home Health Agencies, Percent

Measure Concept	Definition
Measure Category	HHA Entry and Exit
Measure Description	Percentage of open HHAs that close in a given quarter.
Measure Numerator	Count of HHAs with a Medicare termination date occurring in a given quarter.
Numerator Details	N/A
Measure Denominator	Total number of open HHAs of the given quarter.
Denominator Details	Excluding HHAs located in DC or any U.S. territory.
Data Sources	POS

A.2.7 Alternate Payment Models (APM)

The APMs that were active anytime between 2013-2018 and for which data were available are BPCI Initiative and three initiatives of ACOs:

Bundled Payments for Care Improvement (BPCI) Initiative: Under this voluntary initiative, participating ACHs and post-acute care providers (PACs) received bundled payments, as opposed to fragmented, individual service-based payments, for all services rendered during a defined episode of care. BPCI providers were offered incentives based on lowering expenditures and improving quality of care. Two of the four models (Model 2 and 3) for participation in this initiative included bundled payments for post-acute care, and episodes of care for specific clinical outcomes were grouped into "clinical episodes" for the purposes of evaluation.[26] The performance period for the original BPCI model ran from 2013 through 2018. Beginning October 2018, a new iteration of this model, BPCI Advanced went live and is set to run through December 2023.

Accountable Care Organizations: ACOs are multi-disciplinary provider groups (doctor's offices, hospitals, and other providers including home health agencies) who come together voluntarily to provide consistent, efficient, and cost-effective care. By providing a continuous, coordinated care. ACOs aim to avoid unnecessary duplication of services and to prevent medical errors.[27] Since the enactment of the Affordable Care Act, CMS has established a number of ACO-centered alternative payment models. As of 2018, the number of ACOs participating in a Medicare ACO initiative had grown to 649, servicing over

[26] See BPCI general information page, accessible here.
[27] See ACO general information page, accessible here.

12.3 million FFS beneficiaries nationwide.[28] The list of CMS ACO initiatives for which we have data include:

- **Medicare Shared Savings Program** (MSSP) – For providers serving FFS beneficiaries. The SSP model facilitates coordinated care among providers and suppliers to promote higher quality and more efficient care. MSSP offers multiple options where participating providers may select the level of financial risk they are willing to incur[29]; currently active (see below).
- Two additional Center for Medicare & Medicaid Innovation (CMMI) models, **the Advanced Payment ACO Model** and the **ACO Investment Model**, were designed to shepherd ACO-based by current or newly established MSSP providers care into rural and/or underserved areas:
    - **Advanced Payment ACO Model** – Model incentivized rural and physician-based providers to join together voluntarily to provide Medicare FFS beneficiaries better-coordinated and higher-quality care. These newly-formed ACOs, which were commonly smaller and lacking necessary resources for MSSP participation, received both upfront and monthly payments to invest in patient care and infrastructure through the MSSP.[30]; no longer active.
    - **ACO Investment Model** – Model tests the use of pre-paid shared savings to encourage previously- and newly-established MSSP ACOs to expand to rural and underserved areas;[31] currently active.
- **Pioneer ACO Model** – Designed to transition health care organizations and providers already experienced in coordinating care for patients across care settings into ACO-based care more quickly. These experienced organizations were expected to take on a slightly higher level of financial risk than SSP ACOs and consequently stood to receive greater shared savings. The model was run similarly to, though separately from the SSP;[32] no longer active (see Exhibit A-51 below).
- **Next Generation ACO Model** – For ACOs experienced in managing care for populations of patients. In this model, participating ACOs assume greater financial risk than those participating in the SSP model, with the possibility for greater financial rewards. This model was designed to test the effect of strong financial incentives and increased resources for improved patient care and management, on improving patient outcomes and decreasing ACO expenditures;[33] currently active (see Exhibit A-52 below).

[28] See Medicare ACO general information page, accessible here.
[29] See MSSP general information page, accessible here.
[30] See Advance Payment ACO Model general information page, accessible here.
[31] See ACO Investment Model general information page, accessible here.
[32] See Pioneer ACO Model general information page, accessible here.
[33] See Next Generation ACO Model general information page, accessible here.

Exhibit A-51. Active Dates and Data Availability for BPCI Models and ACO Initiatives

	2013	2014	2015	2016	2017	2018
BPCI-Models 2 & 3	✓	✓	✓	✓	✓	✓
BPCI Advanced						✓
ACO Initiatives						
Pioneer ACO	✓	✓	✓	✓		
MSSP*	✓	✓	✓	✓	✓	✓
Next Generation ACO				✓	✓	✓

** Includes the Advanced Payment ACO and ACO Investment Model (AIM)*

A.2.8 Total Performance Score

Guided by parameters established by CMS for CY 2016,[34] the 2013-2017 TPS were calculated as an aggregate performance metric based on 17 HHVBP measures, including: seven OASIS-based outcomes, three OASIS-based processes, two claims-based measures, and the five HHCAHPS measures.[35]

HHA measure rates were created as 12-month weighted averages, weighted by the episode counts, and rolled up from the agency-month to the agency-year level. An HHA's Performance Year measure rates (ranging from 0 – 100 points) were compared to its baseline year measure rates, as well as state-level performance standards: the achievement thresholds (ATs) and benchmarks (BMs). In the HHVBP Model, the baseline year is defined as CY 2015. For our computation of the TPS for years prior to the implementation of HHVBP, we defined the baseline year as the year prior to the designated Performance Year (e.g., for our calculation of TPS values for CY 2014, we used CY 2013 as the baseline year). ATs and BMs for each measure were calculated based on the distribution of baseline year measure rates for all eligible participating HHAs within a given state (see below for eligibility criteria). For each eligible measure, HHAs received the higher of either an Achievement Score or an Improvement Score, between 0 and 10 points. Achievement/Improvement Scores were summed across all eligible measures to form an unadjusted performance measure score. For each HHA, this score was then weighted based on the number of eligible measures reported. Note that we excluded Medicaid-certified only HHAs from the ATs/BMs/TPS calculation.

HHA eligibility criteria for the calculation of the ATs and BMs are as follows:

- For OASIS and claim-based measures, an HHA must have at least 20 episodes of care in the baseline year.
  - If an HHA did not have 20 or more episodes of care for a particular measure, the reported measure rates were recoded as missing.
- For HHCAHPS-based measures, an HHA must have at least 40 completed patient surveys during the baseline year for the five measure rates.
  - If an HHA did not have 40 or more completed patient surveys, the five HHCAHPS measure rates were recoded as missing.
- An HHA must have non-missing data for at least five of 17 eligible measures.

[34] See 2015 HHVBP Final Rule.

[35] Scores for the three new self-reported measures were not factored into our calculation of the TPS since these data are unavailable for non-HHVBP HHAs. Thus, the adjusted composite score for the 17 performance-based measures will be given full weight, as compared to the 90% weight that has been stipulated by CMS.

- An "eligible measure count" (0 – 17) was created to tally the number of non-missing measures for each HHA to determine their inclusion/exclusion from AT/BM calculations.

HHA eligibility criteria for the calculation of TPS are as follows:

- HHAs must have data from the full 12 months of baseline year.
  - HHAs were flagged based on their participation date, extracted from the POS file. HHAs with a participation year greater than or equal to the baseline year were excluded from the data set of eligible agencies.
- HHAs must be in operation as of the end of the performance year or as of the release of the latest available POS file.
  - HHAs were flagged based on their termination status, extracted from the POS file; HHAs that were flagged as terminated (termination year is the same as or before the performance year and non-missing as of the POS data extraction) were excluded from the data set of eligible agencies.
- HHAs must have at least five eligible measures for both the baseline year and the performance year.
  - For measure-level eligibility, see prior list above ("HHA eligibility criteria for calculations of AT/BMs").
- Of an HHA's eligible measures, at least five measures must be the same for both the baseline year and the performance year.
  - HHAs that did not have at least five shared measures between the baseline and performance years were excluded from the data set of eligible agencies.

Similarly, guided by parameters established by CMS for CY 2018,[36] the 2018 TPS were calculated as an aggregate performance metric based on 16 HHVBP measures: seven OASIS-based outcome measures, two OASIS-based process measures (of note, the drug education measure was dropped for CY 2018 and all subsequent years), two claims-based measures, and the five HHCAHPS-based measures. The measure eligibility criteria, measure score calculation and HHA eligibility criteria remain the same as previous years.

Using the above methodology, we calculated the TPS for 2013 – 2018. We then validated our TPS calculations in the HHVBP group against those calculated by the HHVBP Implementation Contractor and reported in the Final Annual TPS and Payment Adjustment Report (released November 2017), the Preliminary Annual TPS and Payment Adjustment Report (released August 2018), the Preliminary Annual TPS and Payment Adjustment Report (released August 2019) for 2016 TPS, 2017 TPS, and 2018 TPS, respectively. Compared to the HHVBP Implementation Contractor, we included 24 additional HHAs in the 2016 TPS calculation, 15 additional HHAs in the 2017 TPS calculation, and 16 additional HHAs in the 2018 TPS calculation. Our inclusion of additional HHAs that were eligible for a TPS were due to differences in timing of access to the underlying measure data. Among HHAs that were included in both our and the HHVBP Implementation Contractor's calculations, the TPS were very close (e.g., correlation coefficient between our TPS and the HHVBP Implementation Contractor's TPS was 0.999 for all three years).

[36] See 2017 HHVBP Final Rule.

A.2.9 New Performance Measures

HHAs self-report three new measures through the CMS Secure Portal:

1. The proportion of eligible HHA personnel vaccinated for influenza within the year.
2. The proportion of patients aged 60 or older who either received or reported having a herpes zoster vaccination.
3. The proportion of patients who have an advance care plan or surrogate decision-maker documented in their medical record, or who had a documented discussion about advance care plans or surrogate but refused or were unable to provide the information.

HHA performance regarding these measures was based on the reporting status (i.e., reported/not reported) for each measure. A binary variable indicating the reporting status of each measure (i.e., reported/not reported) at the HHA-level was available from the CMS Secure Portal. We calculated the proportion of HHAs that reported each measure. The numerator included all HHAs that reported the measure of interest, and the denominator included all HHAs operating under the HHVBP Model.

A.2.10 Relative Change

The relative change provides context for interpreting model estimates and indicates the magnitude by which the impact measures have changed in the post-implementation period with respect to the baseline period values. We calculated the relative change by dividing the respective D-in-D estimate by its measure's corresponding baseline average value and expressing it as a percentage. For example, the cumulative D-in-D estimate of 0.28 for ED Use (no Hospitalization)/First FFS HH Episodes reported in Exhibit 31 of the Annual Report was divided by its baseline average of 11.7% to yield a 2.4% increase (0.28/11.7=0.024).

A.2.11 Annual Savings Calculations

We estimated the annual savings to the Medicare program by multiplying the yearly D-in-D estimate for the Medicare spending per day measures by the total number of eligible days in the HHVBP states for the respective year. Similarly, we obtained estimates of total savings since implementation of HHVBP by multiplying the cumulative D-in-D estimate for the Medicare spending per day measures by the total number of eligible days during 2016-2018 in the HHVBP states. To obtain estimates of average annual savings due to HHVBP, we then divided the calculated total savings estimate (obtained from the cumulative D-in-D estimate) by the number of years in the post-implementation period (in this case, three years).

To illustrate with an example, average daily Medicare spending during and following home health episodes among FFS beneficiaries declined by $1.62/day in HHVBP states, relative to non-HHVBP states for 2016-2018 (i.e., the cumulative D-in-D estimate reported in Exhibit 45 in the Annual Report).

- The number of eligible days in HHVBP states for 2016-2018 included in the calculation of this measure is 259,637,929.
- We multiplied the D-in-D estimate (which corresponds to estimated savings per day) by the total number of days during the corresponding time period to estimate the reduction in total Medicare spending over the three-year period (2016-2018): $1.62 savings/day * 259,637,929 days = $421,840,148.21. (The D-in-D estimate shown is rounded for presentation; a higher level of precision for the estimate was used to calculate the total reduction in Medicare spending shown to the right of the equal sign.)

- We then divided this number by 3 to estimate the average annual savings during 2016-2018 among FFS beneficiaries receiving home health services: $421,840,148.21/3 = $140,613,382.74, or $141 million after rounding.

A.3 Data Sources

For this Annual Report, we accessed CMS administrative data from several sources, including the Chronic Conditions Data Warehouse (CCW) via the Virtual Research Data Center, publicly available data sources, and other CMS HHVBP Contractors. We also received varying analytic levels of measure-specific OASIS data, extracted from CMS' QIES. We used these data sources to create the analytic file necessary to conduct the analyses included in this Annual Report. Claims-based impact measures were calculated and analyzed using several data sources, including:

- Common Medicare Environment (CME) enrollment data
- HHA claims
- SNF claims
- Inpatient hospitalization claims
- Outpatient claims (e.g. EDs, renal dialysis facilities, outpatient rehabilitation facilities)
- Part B claims
- DME claims
- Hospice claims
- Provider of Services (POS) files
- Area Health Resource File (AHRF)

The data sources discussed below were combined to create impact measures and descriptive variables, inform and construct comparison groups, and contribute to the analytic file that was used to conduct the analyses and produce the results presented in the report. Below, we describe the process for obtaining data from these sources in more detail.

A.3.1 Home Health Agency Claims

Purpose. HHA claims defined the home health care episodes for the claims-based impact measures.

Data Acquisition. HHA claims data were pulled from the CCW's RIFs in July 2019, which included all final action claims with claim type code 10 and a service end date (claim "through" date) ranging from January 1999 through June 2019. Although the measurement period for this evaluation began in January 2013, prior years of HHA claims data were needed to establish accurate episode sequence information.

Data Processing. In order to establish the complete set of home health episodes of care, all final-action HHA claims that met the following conditions were included:

- Claim frequency code not equal to each of the following: missing; '0' (Non-payment/Zero Claim); or '2' (Request for Anticipated Payment)
- Included at least one covered visit
- Received a Medicare payment amount greater than $0

Furthermore, if a beneficiary had multiple claims with the same "Statement Covers From" date (i.e., "claim from" date), only the claim with the latest Fiscal Intermediary claim process date was included. In the event that multiple claims for the same beneficiary overlap in a statement period "from" and "through" dates, the "Statement Covers Through" date (i.e., "claim through" date) on the claim starting earlier was adjusted to be the date before the ensuing claim from date. These data steps ensure that a given beneficiary could not be attributed to multiple HHAs on a given day when calculating episode-based impact measures (discussed below).

Each of the resulting HHA claims were considered a final home health episode with episode start date corresponding to the "claim from" date, and episode end date corresponding to the "claim through" date. In concordance with the measure specifications for the two HHVBP claims-based measures,[19] sequence of episodes (or "home health stay") was defined as a series of consecutive home health episodes for a given beneficiary in which the maximum time between consecutive episodes, end date to start date, was 60 days or less. If the time between the prior episode end date and ensuing episode start was greater than 60 days, the ensuing episode start date began a separate home health stay.

An important by-product of HHA claims processing is a beneficiary finder file that includes a unique list of all beneficiaries with a claims-based home health episode ending on or after January 1, 2013, which includes the full measurement period associated with this report (2013 – 2018). For the remainder of this report, we refer to this data set as the "HH Beneficiary Finder File."

A.3.2 Master Beneficiary Summary File

Purpose. MBSF data were the source for determining: beneficiary eligibility in impact measures based on FFS enrollment status, beneficiary demographics, and chronic condition status.

Data Acquisition. MBSF data, sourced from the Common Medicare Environment, were included in the CCW as annual snapshots that were divided into multiple segments: Base (Parts A/B/C/D), Chronic Conditions, Other Chronic or Potentially Disabling Conditions, Cost and Use, and National Death Index. For this Annual Report, we utilized the Base, Chronic Conditions, and Other Chronic Conditions segments.

The MBSF Base segment data provided monthly indicators of enrollment status, in addition to beneficiary demographic information (e.g., state and county of residence, date of birth, gender, race, etc.), for all Medicare enrollees. For this report, beneficiary year-level MBSF Base data were compiled from 2013 to 2018. For beneficiary gender, race, date of birth and date of death, only information from the most recent year of available MBSF for a given beneficiary was included in analyses.

As of the time of this report, the MBSF Chronic Conditions and Other Chronic or Potentially Disabling Conditions segments contained 66 beneficiary-year-level condition flags that were "developed from algorithms that search the CMS administrative claims data for specific diagnosis codes, Medicare Severity Diagnosis Related Group (MS-DRG) codes, or procedure codes."[37] The condition flags were provided at both the middle and end of each year for each Medicare beneficiary; for this report, only end-of-year condition flags were used.

Data Processing. In a given month, a beneficiary was determined to be enrolled in "full" Medicare FFS if they were enrolled in both, Parts A and B (including beneficiaries with dual enrollment in Medicare and Medicaid), and were concurrently not enrolled in an HMO. Based on this definition, monthly indicator variables were created to determine a beneficiary's full FFS enrollment status, which was later used as one of the factors to determine eligibility in claims-based impact measure denominator populations (See Section A.2.2).

End-of-year condition indicator variables from both Chronic Condition MBSF segments indicated whether the beneficiary met the CCW claims criteria and/or whether the beneficiary meets the

[37] See CCW Condition Categories.

coverage criteria (enrolled in Medicare Parts A and B for the entire specified period). From these indicator variables, we further derived condition flags that indicate whether a beneficiary met the claims criteria portion of the CCW condition algorithm, regardless of whether the beneficiary met the FFS coverage criteria (FFS coverage is separately accounted for in the MBSF Base segment).

The total number of Medicare-eligible FFS beneficiaries alive at the beginning of every quarter (e.g., if a beneficiary is no longer FFS next month, they are still included) was also calculated and then divided by 1000.

A.3.3 Non-Home Health Agency Claims

Purpose. We analyzed non-home health claims in order to create impact measures for spending and utilization of services outside of home health care. These claims were also used to determine a beneficiary's care setting immediately prior to a sequence of home health episodes. In this section, we discuss preliminary data processing to support impact measure calculation.

Data Acquisition. For this Annual Report, final action SNF (claim type codes 20 and 30), Inpatient (claim type code 60), and Outpatient (claim type code 40) claims were pulled from the CCW RIFs in July 2019, including claims with a claim through date from April 2010 through June 2019. Claims occurring in this date range potentially contributed to impact measure calculation and determining a home health beneficiary's prior care setting.

Additionally, all claims featuring a beneficiary in our home health Beneficiary Finder File were pulled in July 2019 from the CCW RIFs for Part B, DME, home health, Hospice, SNF, Inpatient, and Outpatient for claims with a claim through date from October 2011 through June 2019. This set of claims was used to calculate total Medicare expenditures and HCC risk scores for FFS home health beneficiaries.

Data Processing. For impact measure calculation, SNF stays were constructed based on SNF claims with an admission date starting on or after October 1, 2011; furthermore, this set of claims was subset to include only claims corresponding to beneficiaries in the HH Beneficiary Finder File (see Section A.3.1). SNFs submit monthly claims throughout a beneficiary's duration of stay, which spans from admission date to discharge date; therefore, a beneficiary's SNF stay was constructed by combining each of the individual SNF claims with the same associated admission date. The SNF stay start date corresponded to the first claim's "claim from" date, while the SNF stay end date corresponded to the last claim's "claim through" date. Medicare payment amounts for each claim within a given stay were summed up to a final stay-level payment amount.

Inpatient and outpatient claims were used to support impact measures related to unplanned ACH and ED use. Inpatient claims were included if they indicated a planned ACH. To identify a planned ACH, we scanned all diagnoses (ICD 9 or 10 codes) reported on the inpatient claim and cross-referenced the list of AHRQ CCS that defined planned hospitalization, as was done in the measure developer's documentation for the two HHVBP claims-based measures.[19] Outpatient claims were included if they indicated ED visits, as identified by the presence of revenue center codes 0450-0459 or 0981; therefore, only outpatient claims containing these revenue center codes were included. This approach is in alignment with the measure developer's documentation for the HHVBP claims-based ED use without hospitalization measure.[19]

For the purposes of total expenditure calculations, all claims for home health beneficiaries were pulled from Part B, DME, home health, Hospice, SNF, Inpatient, and Outpatient CCW RIFs. Claim payment amount was summed across all claims based on each home health episode (for full expenditure measure specifications, see Section A.2.2).

A.3.4 Provider Data

Purpose. We utilized publicly available data on HHAs to control for a variety of agency characteristics (i.e., ownership status, hospital-based vs. freestanding) in construction of comparison groups and D-in-D modeling.

Data Acquisition. Provider data was downloaded from the CMS "Provider of Services" site.

Data Processing. The final annual POS data sets from each year 2013 – 2018 were subset to HHAs based on provider category code "5". Control types provided in the POS data were re-coded into larger groups of "non-profit" (control type codes 1,2,3; church, private not-for-profit, and other, respectively), "for-profit" (control type code 4; private for-profit), and "government-owned" (control type codes 5,6,7; federal, state, and local, respectively). Additionally, facility type codes were re-coded into groups of "hospital-based" (facility type codes 4,5,6; rehabilitation facility, SNF, and hospital, respectively), and "freestanding" (facility type codes 1,2,3,7; visiting nurse association, combination government voluntary, official health agency, and other, respectively). For agencies that first show up in the POS data after their certification dates, we backfilled their characteristics for the years in between (including the year of certification).

A.3.5 County-Level AHRF Data

Purpose. Utilize county-level data from the AHRF to inform comparison group construction based on key county-level demographic information.

Data Acquisition. AHRF data are publicly available from the Health Resources and Services Administration data warehouse, from which we downloaded the 2018 county-level data set.

Data Processing. The following data elements from the AHRF data set were used in the analyses: indication of whether the county was in a rural or urban area (based on CBSA indicator), and the county level average education. The rural/urban variable was used to define rurality of a county, including beneficiaries receiving care in that county, across all analyses. The county level average education was used to define the percentage of persons aged 25 years and older in a county with less than a high school diploma.

A.3.6 OASIS Data

A.3.6.1 Predicted Probabilities for the Risk Adjusted OASIS-Based Outcome Impact Measures

Purpose. We obtained predicted probabilities for the risk adjusted OASIS-based outcome impact measures to support OASIS-based outcomes impact measure calculation and analysis.

Data Acquisition. We received OASIS-based episode-level data (extracted from QIES) for each of the HHVBP OASIS-based outcome impact measures, in which episodes of care were determined from a series of OASIS assessments and had an episode end date ranging from 2013 through 2018.

Data Processing. The data set contained episode-level measure-specific observed and predicted probability values for each of the HHVBP OASIS-based outcome impact measures, as well as a state and facility identifier (unique only within a given state) in which the episode of care occurred. The combination of state and facility identifier were used to look up the HHA's CCN using the CCW's HHA facility file.

A.3.6.2 QIES Roll-Up Measure Data for the OASIS-Based Process Measures

Purpose. We obtained QIES roll-up measure data for OASIS-based process measures in order to calculate and analyze the OASIS-based process impact measures.

Data Acquisition. We received HHA-month-level data sets (extracted from QIES) that contain observed measure values and episode counts for each of the process measures, spanning 2013 through 2018.

Data Processing. Similar to the episode-level QIES data set described above, the data set also contained state and facility identifier (unique only within a given state) in which the episode of care occurred; the combination of state and facility identifier were used to look up the HHA's CCN using the CCW's HHA facility file.

A.3.6.3 Raw OASIS Assessment Data

Purpose. Raw item-level OASIS data were obtained to provide covariates for our analytic models and support our OASIS impact measure analyses.

Data Acquisition. Assessment data were extracted from the CCW Oracle database.

Data Processing. The assessments were subset to versions C, C1, or C2. The most recent SOC/ROC assessments for each beneficiary were flagged based on M0100. Risk factor variables were calculated based on raw assessment data according to CMS documentation[38]. Response-level indicator variables were created for a subset of assessment items, including M0100, M1000, M1810, M1620, M1710, M1870, M2110, M1800, M1880, M1730, M1308, M1311, M2200, M1830, M1400, M1610, M1034, M1840, M1860, M2020, M1720, M1230, M1220, M1870, and M1910. Patient diagnostic information, from which chronic and acute conditions were derived, was pulled from items M1010, M1016, M1011, M1017, M1020, M1022, M1024, M1021, M1023, and M1025.

A.3.7 HHCAHPS and Star Ratings Data

Purpose. We utilized HHCAHPS data to analyze the five patient experience impact measures. We also used the Quality of Patient Care Star Ratings and the risk-adjusted percentage of home health stays in which patients were admitted to an ACH during the 60 days following the start of the home health stay to assess the utilization of high quality home health services.

Data Acquisition. We downloaded publicly available data from the Home Health Compare (HHC) website in July 2019 for CYs 2013 – 2018.[39]

Data Processing. The HHCAHPS data included a score value for each of the five HHCAHPS-based impact measures (see Section A.2.5), rounded to the nearest whole number, HHA's CCN, the number of

[38] Hittle DF, Nuccio EJ. (2017) Home Health Agency Patient-Related Characteristics Reports: Technical Documentation of Measures - Revision 4.1. Prepared for: Department of Health and Human Services; Centers for Medicare & Medicaid Services. *University of Colorado School of Medicine - Division of Health Care Policy and Research*.

[39] These data are available here.

completed surveys by respondents that received care from the given HHA, and the response rate. For this report, we used data from the January through December report from each year of our analyses, 2013 – 2018 (i.e., measurement period is the CY).

Our analysis of the access to high quality home health services was based on the measures published for July of 2015 and 2016 and October of 2017 and 2018. The star ratings data were rounded to the nearest whole number; the "high-quality" category we defined therefore included star ratings between 3.5 and 5. We defined the top 40% of agencies with respect to low hospital admission rates as high-quality agencies, according to the ACH quality measure.

A.3.8 New Measures Data

Purpose. To provide descriptive statistics on the three new agency-reported measures.

Data Acquisition. We downloaded the Final Annual TPS and Payment Adjustment Report for CY 2018, made available on the CMS Enterprise Portal on November 6, 2019.

Data Processing. This report provided HHA-level indicators for whether the agency reported on each of the three measures, in addition to providing the number of points earned for each new measure, and how these points were weighted to contribute to the final TPS.

A.3.9 Provider Enrollment, Chain and Ownership System Data

Purpose. PECOS data were used to determine HHA chain information.

Data Acquisition. PECOS data were downloaded from the Integrated Data Repository in multiple iterations corresponding to monthly updates of the PECOS enrollment and chain affiliation data.

Data Processing. In order to determine HHA chain affiliation at a given point in time, we extracted data from two views in the Medicare Virtual Data Mart: V2_MDCR_PRVDR_MDCR_ID (parent table for PECOS enrollment database) and V2_MDCR_PRVDR_CHAIN (provider chain affiliation history). All available data were extracted for providers that were identified as HHAs, based on the last four digits of CCN, by joining the two data views based on the tables' key identifier: PRVDR_ENRLMT_ID. The resulting data set provided a history of chain affiliation for each HHA represented in the PECOS database. This process was repeated in multiple iterations from July 2018 through July 2019, in order to account for monthly updates to the PECOS enrollment and chain affiliation data. Per CMS Integrated Data Repository (IDR) Support, the PECOS data extracts they receive via the "Global Extract File" do not consistently and reliably preserve historical enrollment and chain affiliation data; therefore, we decided to combine monthly extracts and, for each HHA, choose the most recent extract in which the HHA was present. Further, as described in Section A.2.1.3, the most recent chain affiliation data extracted from PECOS would only contribute to the chain affiliation indicator for CY 2018 in this report, while pre-2018 chain affiliation data would be carried over from the previous Annual Report.

A.3.10 Cost Reports

Purpose. Public use HHA Cost Report files (CMS Form 1728-94 and Form 2552-10) for fiscal years 2012–2018 were used to obtain chain information and to calculate profitability.

Data Acquisition. Cost Report data sets for both freestanding and hospital-based HHAs are publicly available via CMS' Healthcare Cost Report Information System.[40]

Data Processing. The fiscal year 2018 Cost Report file was not finalized at time of reporting, and all records for 2018 represented the most current data available. For any provider number with more than one Cost Report record in a given year, the Cost Report representing the latest fiscal year end date was maintained for analyses.

A.3.11 MedPAR

Purpose. The Medicare Provider Analysis and Review (MedPAR) file for CYs 2013-2018 were used to identify hospitalizations of FFS Medicare home health users prior their home health episode for analyses of changes in functional status at the OASIS SOC. MedPAR data were used rather than the inpatient claims data (claim type code 60; Section A.3.3) as the former provides access to summary characteristics for inpatient stays.

Data Acquisition. Final MedPAR RIFs were pulled from the CCW in November 2019.

Data Processing. MedPAR records were linked to OASIS data using beneficiary ID and hospital discharge date from MedPAR, and the SOC date listed in the OASIS assessment. OASIS and MedPAR records were matched when the SOC date was no later than 30 days from the hospital discharge date for a particular beneficiary.

A.3.12 Master Data Demonstration (MDD)

Purpose. Identify Medicare FFS beneficiaries who were aligned with ACOs (i.e., MSSP ACO, the Next Generation ACO Model, and the Pioneer ACO Model) during their home health episode.

Data Acquisition. The MDD is available in the CMS Virtual Research Data Center (VRDC) as part of the CCW, in association with the CMS Master Data Management (MDM) system. The data were pulled from the MDD library using the extracts from multiple dates, depending on the specific ACO model.

Data Processing. For the MSSP, we obtained the finalized list of retrospectively aligned beneficiaries for 2013-2018 from the MDD_BENE_EXTRACT_LINKED_190527 extract. SSP ACO-aligned beneficiaries were identified by program_id = '08' and bene_ctgry_cd = 'F', which includes beneficiaries aligned to the Advance Payment ACO and ACO Investment Model.

For the Next Generation ACO, we obtained prospectively aligned beneficiaries for 2016-2018 from the first MDD_BENE_EXTRACT_LINKED extract released in March of the year following the year of interest. Next Generation ACO beneficiaries were identified by program_id = '21'.

For the Pioneer ACO, we obtained prospectively aligned beneficiaries for 2013-2016 from the first MDD_BENE_EXTRACT_LINKED extract released in March of the year following the year of interest. Pioneer ACO beneficiaries were identified by program_id = '07'. Beneficiary alignment effective and alignment end dates were used.

[40] These data are available here.

With these data, we defined a window of ACO participation. In combination with home health episode start and end dates, we created a flag for Medicare home health beneficiaries whose home health episode overlapped with participation in an ACO.

A.3.13 Data from CMMI

Purpose. Identify Medicare FFS beneficiaries who were aligned with the BPCI Model (specifically, Model 2 or Model 3) or the BPCI Advanced Model during their home health episode.

Data Acquisition. These files were provided directly by CMMI, covering Q3 2013 through the Q3 2018 for BPCI and Q4 2018 for BPCI Advanced.

Data Processing. The data set contained beneficiary-level information on BPCI clinical episode begin date and end dates. With these data, we defined a window of BPCI participation. In combination with home health episode start and end dates, we created a flag for Medicare home health beneficiaries whose home health episode overlapped with participation in BPCI.

A.3.14 Data from the HHVBP Implementation Contractor

Purpose. To support calculating a TPS for HHAs in the non-HHVBP states, which can be used as a metric to compare HHAs in non-HHVBP states with HHAs in HHVBP states.

Data Acquisition. We requested QIES measure roll-up extracts spanning 2013 – 2018 and HHA size data.

Data Processing. With guidance from the HHVBP Implementation Contractor, we received the QIES roll-up data sets that align in content with those used to produce the Annual TPS and Payment Adjustment Report; however, the variable timing of QIES data extracts, as compared to those used by the Implementation Contractor, may result in small discrepancies in measure values. We also received an HHA-level file containing metrics of HHA size, including a count of episodes and unique beneficiaries during 2015; these values were used by the HHVBP Implementation Contractor to determine the size cohort for each of the HHAs that were subject to payment adjustment. These files, in conjunction with the publicly reported HHCAHPS measure data, allowed us to calculate a TPS for both HHVBP and non-Model HHAs, which served as an impact measure for comparative analyses between HHAs in non-HHVBP states and HHVBP states.

A.3.15 Data from the HHVBP Technical Assistance Contractor

Purpose. To conduct descriptive analysis that assesses use and utilization of the HHVBP Connect website.

Data Acquisition. We requested and obtained HHVBP Connect data for CY 2018 from the HHVBP Technical Assistance contractor.

Data Processing. With guidance from the HHVBP Technical Assistance Contractor, we compiled the multiple data files into an annual file for 2018 which included monthly unique visitors, resource download, and webinar participation.

A.3.16 Primary Data Collection – Fielding HHCAHPS Survey to Beneficiaries at Small HHAs

We administered the 34-item HHCAHPS instrument to beneficiaries who received home health care from small agencies that are otherwise exempt from fielding the HHCAHPS survey. This data collection allowed us to examine any potential unintended consequences related to the exclusion of HHCAHPS measures from performance incentives for small HHAs.

A.3.16.1 Sample Design

We designed the sampling process to recruit as many beneficiaries served under the HHVBP Model as possible and to align with the inclusion and exclusion criteria specified on the "Home Health Care CAHPS Survey" website where feasible.[41]

In March 2018, we received the list of HHAs that were exempt from the HHCAHPS survey (i.e., agencies that did not participate in the HHCAHPS cycle that ran from April 2016-March 2017) from the HHCAHPS contractor. These HHAs met one of the two following criteria: 1) they served fewer than 60 HHCAHPS-eligible patients in the prior CY; or 2) they were exempt for receiving Medicare certification after the cutoff for the Annual Payment Update. In addition, we included all HHAs that served fewer than 60 beneficiaries in 2016, based on data obtained from the HHVBP Implementation contractor. We included agencies from this list that met the following inclusion criteria:

- Must have completed an OASIS assessment form for no more than 70 beneficiaries in the preceding 12-month period (03/01/2017 through 02/28/2018).[42]
- Must be included in the HHC data as of October 2017 with the following footnotes regarding HHCAHPS data: "No survey results are available for this period" or "Zero, or very few, patients met the survey's rules for inclusion."
- Must have been ineligible for TPS calculation for CY 2016.
- Must be in the Provider of Services file, which were used to determine key HHA characteristics for the random sampling procedure.
- Must have an active and valid link between its QIES facility identifier and a CCN, based on the CCW-provided QIES facility identifier to CCN crosswalk data set, which was used to link OASIS assessment data to an agency's CCN.

We completed these steps for determining the final list of HHAs at the outset of the survey and mid-way through the fielding period. This resulted in 1,777 HHAs (260 in HHVBP states; 1,517 in non-HHVBP states) that comprise the universe of small HHAs in 2018 from which we drew beneficiaries for each of the six, two-month phases (realizing that some of the small agencies may not have beneficiaries for each wave). From the 1,777 HHAs, we generated a list of beneficiaries who had an OASIS assessment indicating they received a SOC, ROC, or recertification within the designated two-month span for each sampling phase (e.g., January-February 2018 for the first phase). These assessments were pulled from the CCW Oracle database for the time-period looking back three and four months (i.e., a two-month

[41] Additional information is available here.

[42] Data limitations prevented us from fully implementing all of the HHCAHPS beneficiary-level inclusion and exclusion criteria (see previous footnote), and we anticipated that a portion of each HHA's beneficiaries would be excluded if we were able to implement them. Therefore, we used a cut point of 70 to strike a balance between being too conservative (i.e., the national HHCAHPS survey's threshold of 60) and mistakenly including HHAs that may already be fielding the HHCAHPS.

window with a two-month look-back), identifying all beneficiaries who received an assessment in the two-month window.[43]

From this initial list of beneficiaries, we excluded patients who received hospice claims or had died in 2018 as well as beneficiaries who had been sampled in a previous phase while receiving care at the same HHA as in the current phase. Additionally, in each subsequent bi-monthly phase, we excluded any beneficiaries served by agencies that passed the 70 beneficiary threshold since the start of the sampling period (i.e., any HHAs that were no longer small). This resulted in the pool of beneficiaries who were eligible to be surveyed.

We aimed to survey 18,000 beneficiaries served by small HHAs in CY 2018 (i.e., 3,000 beneficiaries in each of the six phases). A beneficiary could only be sampled once per phase, but could be sampled in more than one phase if they were seen by a different small HHA in a subsequent phase.[44] For each survey phase, we selected the beneficiary sample in two steps. First, to include as many HHVBP beneficiaries as possible, we selected all patients served under the HHVBP Model. We then drew a sample of beneficiaries from the non-HHVBP states that matched the distribution of the HHVBP beneficiaries across three agency level characteristics:

(i) Ownership: For-profit or other (non-profit or government-owned)
(ii) Setting: Freestanding or hospital-based
(iii) Chain affiliation: Affiliated or not affiliated [45]

We used SAS Enterprise Guide version 7.15 (SAS Institute, Cary, NC) to calculate the distribution of HHVBP beneficiaries in each ownership-setting-chain stratum. We then calculated the number of non-HHVBP beneficiaries necessary to survey 3,000 beneficiaries total and the number of non-HHVBP beneficiaries to sample from each stratum. We used the SAS survey procedure *proc surveyselect* to randomly select non-HHVBP beneficiaries within each stratum. If a stratum did not contain enough beneficiaries in non-HHVBP states, we selected all of the beneficiaries from it, and then selected additional non-HHVBP beneficiaries from another stratum. If there were no HHVBP HHAs in a particular stratum, no non-HHVBP beneficiaries were included from that stratum.

A.3.16.2 Fieldwork

We fielded the 34-item HHCAHPS survey[46] to beneficiaries March 2018 -June 2019, using a mixed mode approach of mail and telephone follow-up to non-responders. We obtained HHA name from the POS and beneficiary contact information from the Medicare Enrollment Database.

Over the six phases, we surveyed 16,969 beneficiaries served by small HHAs in CY 2018. The surveys are unique at patient and home health agency level. The total number of returned surveys that were complete or partially complete was 4,324 (777 from HHVBP states, and 3,547 from non-HHVBP states)

[43] This data pull was done as soon as the assessments were loaded into the CCW Oracle database, generally six weeks after the last assessment date (e.g., assessments January- February, 2018 were available in mid-April 2018).
[44] If a patient received home health services from more than one HHA in a single phase, we selected only one of their HHAs as the focus for the survey.
[45] HHAs with missing chain information were considered to be non-chain.
[46] The HHCAHPS survey instrument is available here.

for an overall response rate of 25.5% (23.1% for HHVBP beneficiaries, 26.1% for non-HHVBP beneficiaries).

To understand differences between beneficiaries who responded to the survey versus those who did not, we compared beneficiary and agency characteristics between "responders" (i.e., beneficiaries who had a complete or partially complete survey) vs. "non-responders".[47] Specifically,

- A survey was considered to be "complete" if at least 50 percent of the questions were answered among HHCAHPS survey questions 1–11, 15–21, and 24–25.[46]
- A survey was considered to be "partially complete" if the number of valid responses provided to the list of HHCAHPS survey questions above was between 1 and 9.
- A survey was considered to be "non-response" if no valid responses were provided to the list of HHCAHPS surveys questions above, if the beneficiary refused, or the survey was returned blank.

Compared to beneficiaries who did not respond to the survey, beneficiaries who returned a complete or partially complete survey were more likely to be older, female and white, and less likely to be dual eligible or have traditional Medicare (Exhibit A-52). Responders were also less likely to receive home health care from small agencies that were for-profit, not affiliated with a chain, and were freestanding. Differences between responders and non-responders were generally the same when examining HHVBP beneficiaries and non-HHVBP beneficiaries separately (not shown).

Exhibit A-52. Beneficiary and HHA Characteristics, by Responders and Non-responders

Beneficiary and HHA Characteristics	Responders (N=4,324)	Non-Responders (N=10,515)
Age Categories*		
Age 0 - 64	23.6%	32.2%
Age 65 - 84	55.0%	50.8%
Age 85 and Older	21.4%	17.0%
Female*	64.3%	59.9%
Race/Ethnicity*		
Hispanic (regardless of race)	9.7%	17.2%
Black, non-Hispanic	31.1%	33.8%
White, non-Hispanic	54.9%	42.9%
Other, non-Hispanic	4.0%	5.8%
Multiracial, non-Hispanic	0.3%	0.3%
Insurance (not Mutually Exclusive)		
Dual Eligible*	59.4%	65.5%
Medicaid Only	1.5%	1.5%
Medicaid (HMO + FFS)*	25.7%	22.9%
Medicare FFS*	70.7%	74.0%
Medicare Advantage	9.9%	9.1%
Ownership*		

[47] Beneficiaries who were reported as deceased, mentally or physically unable to respond, language barrier, or invalid contact information were excluded from the analyses.

Beneficiary and HHA Characteristics	Responders (N=4,324)	Non-Responders (N=10,515)
For-profit or government owned	91.1%	94.8%
Non-profit	8.9%	5.2%
Chain Status*		
Affiliated	5.9%	4.8%
Not-Affiliated	94.1%	95.2%
Setting*		
Freestanding	97.6%	99.2%
Hospital-Based	2.4%	0.8%

** p-value ≤0.001 for difference between responders and non-responders.*
Responders are defined as beneficiaries who had a complete or partially complete survey.
Data source: OASIS Assessment file for Beneficiary Characteristics; POS file for 2018 Agency Characteristics

A.3.16.3 Analysis

There were a total of 16,969 surveys administered to beneficiaries from small HHAs across the six waves in 2018. Among the 4,324 returned surveys, 4,068 were complete and used in the main analysis presented in the main report. A survey was considered to be "complete" if at least 50 percent of the questions were answered among HHCAHPS survey questions 1–11, 15–21, and 24–25[46]. We merged the survey data with the OASIS Assessment file to get the patient characteristics and with the POS file to get 2018 agency characteristics. We calculated a descriptive table on select beneficiary characteristics as well as the three agency characteristics that we matched to check for significant differences (via a bivariate chi-square test) between beneficiaries in HHVBP and non-HHVBP states.

We calculated the five HHCAHPS measures (i.e., two global ratings and three composite measures) from complete surveys for HHVBP and non-HHVBP states separately as specified on the "Home Health Care CAHPS Survey" website.[48] We calculated the five HHCAHPS measures for each survey as long as one question was answered from the measure members in the following manner:

- To receive a score on the **Care of Patients** composite measure, at least one question among Questions 9, 16, 19 and 24 had to be answered.[48]
- To receive a score on the **Communications between Providers and Patients** composite measure, at least one question among Questions 2, 15, 17, 18, 22 and 23 had to be answered.[48]
- To receive a score on the **Specific Care Issues** composite measure, at least one question among Questions 3, 4, 5, 10, 12, 13, and 14 had to be answered.[48]
- To receive a score on **Rating of Care Provided by the Agency** global measure, Question 20 had to be answered.[48]
- To receive a score on **Willingness to Recommend the Agency to Friends and Family** global measure, Question 25 had to be answered.[48]

We fitted a multivariate regression model for each of the five HHCAHPS measures to assess differences between HHVBP and non-HHVBP states in patient experience at small HHAs in 2018. In our model, we

[48] Additional information on measure construction is available here.

adjusted for patient's age, sex, race/ethnicity, and insurance status, as well as for the agency's ownership, setting, and chain status.

A.4 Analytic File Creation

Below, we first describe the methods that were employed for the different subtopics that are included in the main report, followed by a description of how we created a single Unified Analytic File (UAF) that was used to generate the results presented in this report. The unit of observation of the UAF was either a claims-based episode or an OASIS-based episode.

A.4.1 Analytical Methods for Subtopics

A.4.1.1 Case-Mix

Purpose: To determine if case-mix of beneficiaries receiving home health care have changed over time between HHVBP states and Non-HHVBP states.

Data Acquisition: The case-mix analyses used home health episode claims data, OASIS assessment data, and Part B carrier, inpatient and outpatient claims.

Data Processing: We included all HH episodes that occurred between 2013 and 2018, excluding DC and U.S. territories. We defined three measures of case-mix: an OASIS ADL Composite measure, poor overall health status, and HCC score (first episode) and examined trends in the mean values of these measures between HHVBP states and non-HHVBP states in the baseline (2013-2015) and post-HHVBP period (2016-2018). We computed yearly and cumulative D-in-D estimates for each of the case-mix measures adjusting for agency characteristics (setting, ownership, HHA age, HHA size, and chain status), state fixed effects and state-specific linear trends in the regression model. Details on how these measures were constructed are given below.

ADL Composite Measure

The OASIS ADL composite measure is a composite score of the following OASIS items at the start of care: grooming (M1800), ability to dress upper body (M1810), ability to dress lower body (M1820), bathing (M1830, previously described in Exhibit A-18), toilet transferring (M1840), bed transferring (M1850, previously described in Exhibit A-17), ambulation/locomotion (M1860, previously described in Exhibit A-16), and feeding or eating (M1870). The OASIS questions and response options that have not been previously described in this report are shown below.

For each OASIS item, the response was divided by the highest value allotted for that measure so that the standardized score would range from 0 to 1. For example, for grooming (M1800) the highest value of the response is 3 (see Exhibit A-53) and hence each response is divided by 3 to obtain the standardized score. The standardized scores for all 8 OASIS questions (listed in the tables below) were summed to create the composite score. This score ranges from 0 (highest level of functional status) to 8 (lowest level of functional status).[49]

[49] Scharpf TP, Madigan EA. (2010) Functional Status Outcome Measures in Home Health Care Patients with Heart Failure. *Home Health Care Serv Q* 29(4): 155-170.

Exhibit A-53. Grooming

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1800 – Grooming	Current ability to tend safely to personal hygiene needs (specifically: washing face and hands, hair care, shaving or make up, teeth or denture care, or fingernail care)	Able to groom self unaided, with or without the use of assistive devices or adapted methods	00	0
		Grooming utensils must be placed within reach before able to complete grooming activities	01	0.33
		Someone must assist the patient to groom self	02	0.67
		Patient depends entirely upon someone else for grooming needs	03	1

Source: OASIS-C2 Guidance Manual

Exhibit A-54. Ability to Dress Upper Body

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1810 – Ability to Dress Upper Body	Current ability to dress upper body safely (with or without dressing aids) including undergarments, pullovers, front-opening shirts and blouses, managing zippers, buttons, and snaps	Able to get clothes out of closets and drawers, put them on and remove them from the upper body without assistance	00	0
		Able to dress upper body without assistance if clothing is laid out or handed to the patient	01	0.33
		Someone must help the patient put on upper body clothing	02	0.67
		Patient depends entirely upon another person to dress the upper body	03	1

Source: OASIS-C2 Guidance Manual

Exhibit A-55. Ability to Dress Lower Body

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1820 – Ability to Dress Lower Body		Able to obtain, put on, and remove clothing and shoes without assistance	00	0

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
	Current ability to dress lower body safely (with or without dressing aids) including undergarments, slacks, socks or nylons, shoes	Able to dress lower body without assistance if clothing and shoes are laid out or handed to the patient	01	0.33
		Someone must help the patient put on undergarments, slacks, socks or nylons, and shoes	02	0.67
		Patient depends entirely upon another person to dress lower body	03	1

Source: OASIS-C2 Guidance Manual

Exhibit A-56. Bathing

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1830 – Bathing	Bathing: Current ability to wash entire body safely. Excludes grooming (washing face, washing hands, and shampooing hair).	Able to bathe self in shower or tub independently, including getting in and out of tub/shower	00	0
		With the use of devices in shower/tub	01	0.17
		With intermittent assistance in shower/tub	02	0.33
		Participates with supervision in shower/tub	03	0.50
		Independent at sink, in chair, or on commode	04	0.67
		Participates with assist at sink, in chair, or commode	05	0.83
		Unable to participate; bathed totally by another	06	1

Source: OASIS-C2 Guidance Manual

Exhibit A-57. Toilet Transferring

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1840 – Toilet Transferring		Able to get to and from the toilet and transfer independently with or without a device	00	0

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
	Current ability to get to and from the toilet or bedside commode safely and transfer on and off toilet/commode	When reminded, assisted, or supervised by another person, able to get to and from the toilet and transfer	01	0.25
		Unable to get to and from the toilet but is able to use a bedside commode (with or without assistance)	02	0.50
		Unable to get to and from the toilet or bedside commode but is able to use a bedpan/urinal independently	03	0.75
		Is totally dependent in toileting	04	1

Source: OASIS-C2 Guidance Manual

Exhibit A-58. Bed Transferring

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1850 – Bed Transferring	Transferring: Current ability to move safely from bed to chair, or ability to turn and position self in bed if patient is bedfast	Able to independently transfer	00	0
		Able to transfer with minimal human assistance or with use of an assistive device	01	0.20
		Able to bear weight and pivot during the transfer but unable to transfer self	02	0.40
		Unable to transfer self and is unable to bear weight or pivot when transferred by another person	03	0.60
		Bedfast, unable to transfer but is able to turn and position self in bed	04	0.80
		Bedfast, unable to transfer and is unable to turn and position self	05	1

Source: OASIS-C2 Guidance Manual

Exhibit A-59. Ambulation/Locomotion

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1860 – Ambulation/Locomotion	Current ability to walk safely, once in a standing position, or use a wheelchair, once in a seated position, on a variety of surfaces.	Able to independently walk on even and uneven surfaces and negotiate stairs with or without railings (specifically: needs no human assistance or assistive device	0	0
		Able to independently walk with the use of a one-handed device	01	0.17
		Requires two handed device or human assistance	02	0.33
		Walks only with supervision or assistance from another at all times	03	0.50
		Chairfast, unable to ambulate but is able to wheel self independently	04	0.67
		Chairfast, unable to ambulate and is unable to wheel self	05	0.83
		Bedfast, unable to ambulate or be up in a chair	06	1

Source: OASIS-C2 Guidance Manual

Exhibit A-60. Feeding or Eating

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
M1870 – Feeding or Eating	Current ability to feed self meals and snacks safely. Note: This refers only to the process of eating, chewing, and swallowing, not preparing the food to be eaten	Able to independently feed self	00	0
		Able to feed self independently but requires: (a) meal set-up; OR (b) intermittent assistance or supervision from another person; OR (c) a liquid, pureed or ground meat diet	01	0.20
		Unable to feed self and must be assisted or supervised throughout the meal/snack	02	0.40
		Able to take in nutrients orally and receives supplemental nutrients through a nasogastric tube or gastrostomy	03	0.60

OASIS Item	OASIS Question	Variables	OASIS Response	Standardized Score
		Unable to take in nutrients orally and is fed nutrients through a nasogastric tube or gastrostomy	04	0.80
		Unable to take in nutrients orally or by tube feeding	05	1

Source: OASIS-C2 Guidance Manual

Poor Overall Health Status

The poor overall health status measure is constructed using the OASIS item M1034. This measure was calculated as a percentage of episodes with response options 2 and 3 (indicative of fragile health and high health risks) out of all the episodes that have a response to the overall health status question (M1034) at the start of care.

Exhibit A-61. Overall Status

OASIS Item	OASIS Question	Variables	OASIS Response
M1034 – Overall Status	Which description best fits the patient's overall status?	The patient is stable with no heightened risk(s) for serious complications and death (beyond those typical of the patient's age)	00
		The patient is temporarily facing high health risk(s) but is likely to return to being stable without heightened risk(s) for serious complications and death (beyond those typical of the patient's age)	01
		The patient is likely to remain in fragile health and have ongoing high risk(s) of serious complications and death	02
		The patient has serious progressive conditions that could lead to death within a year	03

Source: OASIS-C2 Guidance Manual

HCC Score (First Episode)

The claims-based case-mix measure used in this analysis was the episode-level HCC risk scores, calculated for the first episode in the sequence or for the earliest episode during the previous year among sequences that began more than a year ago (previously described in Section A.2.1.2).

A.4.1.2 Causes of Hospitalization

Purpose: To determine the relationship between home health episodes and inpatient hospitalizations

Data Acquisition: Cause of Hospitalization analyses used the inpatient hospitalization claims, the HH episode claims data.

Data Processing: We included all first HH episodes that occurred between 2013 and 2018, excluding DC and U.S. territories. HH episodes were said to have a prior hospitalization if they had an inpatient hospitalization (both unplanned and planned) 14 days or less prior to the start of the episode. Hospitalizations that occurred on the same day of the episode were excluded. HH episodes that had an acute and unplanned hospitalization within 60 days after the start of the episode were flagged as having a HH hospitalization. HH episodes were categorized into four groups based on whether they had prior or HH hospitalization

(a) HH episodes with no prior hospitalization and no HH hospitalization
(b) HH episodes with prior hospitalization only
(c) HH episodes with HH hospitalization only
(d) HH episodes with both prior hospitalization and HH hospitalization

We calculated the readmission rate from episodes that had a HH hospitalization among all episodes that had a prior hospitalization. We also examined hospitalization diagnosis using two separate methods: 1) Medical or Surgical type diagnosis; and 2) Major Diagnostic Categories. Medical or Surgical type of diagnosis were derived from MS-DRG [50]: a medical DRG is assigned when no significant procedure was performed, and surgical DRG is assigned when a significant procedure was performed. Major Diagnostic Categories are formed by dividing all possible principal diagnoses (from MS-DRG) into 26 mutually exclusive diagnosis areas largely corresponding to a single organ system. All analyses were stratified by years and intervention state status.

A.4.1.3 Frontloading

Purpose: To determine the frequency, timing, and discipline of HH visits within HH episodes. HH visits can be classified by provider type and include visits from a HH aide, medical social services, an occupational therapist, a physical therapist, a skilled nurse, or a speech therapist (for visit type determinations, see Section A.2.1.2)

Data Acquisition: Frontloading analyses were completed using HH visit claims data, the HH episode claims data, the inpatient hospitalization claims, and HHA POS data.

Data Processing: We included all first HH episodes that occurred between 2013 and 2018, excluding DC and U.S. territories and used the HH visits SAF (see Section A.2.1.2)to determine average cumulative visits for each visit type for five time checkpoints: 1, 7, 14, 21, and 28 days following the start of a HH episode. The calculation of average cumulative visits per episode by a particular time checkpoint included a numerator of cumulative visits broken out by visit type, aggregated through that time checkpoint for episodes that lasted at least as long as the time checkpoint and a denominator that included the total number of [first] episodes that lasted at least as long as the time checkpoint under consideration. Overall averages for each time checkpoint were determined by summing individual visit type averages. Further, annual values were pooled to display weighted pre- and post-intervention average cumulative visits for each time checkpoint. (2016 – 2018) (2013 – 2015) Subsequent analyses stratified by prior care setting and agency characteristics were conducted similarly. For the prior care analysis, HH episodes were categorized as post-acute (identified by the CCN ending in 0001-0879, 0800-0899, or 1300-1399 on an inpatient claim within 14 days prior to the home health episode) or non-post-acute (i.e., community referral or non-ACH institutional referral). Visit distributions at each time

[50] See MS-DRG Classifications and Software, accessible here.

checkpoint were also determined using episode-level aggregations of visits of each type, to obtain the minimum and maximum visits received, as well as the 25th, median, 75th, and 99th percentile values and the interquartile range. All frontloading analyses focused on first episodes only and were stratified by years and intervention state status.

A.4.1.4 Entry and Exit of HHAs

Purpose: To calculate the rates of HHA openings and closures over time.

Data Acquisition: We used POS data (see Section A.3.4). Empirically, there was a data lag in certification and termination dates in CMS POS data beyond the lag for other data sources used in this report. The completion rate of CMS POS data is about 99% for participation dates and 93% for termination dates, with a one year lag in reporting. Therefore, our HHA entry and exit analyses are reported through Quarter 2 of 2018 (i.e., 12 months from when the data were pulled for this Annual Report) instead of through the end of 2018 as is done for other analyses. See Exhibit C-29 in the Appendix of Supplemental Tables and Results for the quarterly counts of entering, exiting, and open HHAs in HHVBP and non-HHVBP states for 2013 Q1 through 2018 Q2.

Data Processing: Entry of new HHAs was determined by the HHA certification date in CMS POS data. The HHA entry rate was calculated by dividing the number of HHAs with certification dates in a given quarter divided by the number of HHAs open at any point in a given quarter. Exit of existing HHAs was determined by the HHA termination date in CMS POS data. The HHA exit rate was calculated by dividing the number of HHAs with termination dates in a given quarter divided by the number of HHAs open at any point in a given quarter (see Section A.2.6 for measure definitions).

We also calculated periods of inactivity when an HHA is open according to the POS certification and termination date, but the HHA does not have any OASIS or claims-based HH episodes. We observed that these HHAs are often small, in the process of opening or closing, and tend to serve specialized groups of patients such as pediatric patients (who are excluded from OASIS assessments and may not have Medicare coverage). We excluded these inactive HHAs from most of our analyses based on OASIS or claims-based episodes, where HHA counts are determined using the presence of OASIS or claims-based HH episodes in a given year and where HH episodes are the basis of the HHVBP program quality measures. However, we *included* these inactive facilities in the denominator of the HHA entry and exit analyses, which uses CMS POS data to determine the number of open HHAs. Therefore, the HHA counts used in the entry and exit analyses may differ from other analyses that exclude agencies without OASIS or claims-based HH episodes in a given time period.

A.4.1.5 Low/High Performers and Social Risk Factors

Purpose: To examine the extent to which agencies were in the same relative position within their state cohort between years, for both HHVBP group and Non-HHVBP group; as well as the association between agency performance in TPS and patient mix treated at the agencies.

Data Acquisition: Agency TPS calculated using QIES roll-up data, POS data, and HHCAHPS data.

Data Processing: We identified 8,550 agencies eligible for TPS based on performance year 2017 (HHVBP: 1,631; Non-HHVBP: 6,919), and 8,401 agencies eligible for TPS based on performance year 2018 (HHVBP: 1,622; Non-HHVBP: 6,779). Among these agencies, 7,939 were eligible to receive a TPS for both performance year 2017 and 2018. We then classify agencies into three groups (high, middle, and low

performers) for each year, based on TPS quartiles by state. The top 25% is defined as "high performer", and bottom 25% is defined as "low performer", and the middle 50% is defined as "middle performer". The last step was to combine two years of data. Treat agencies classified into "high performer" group in both years as final "higher TPS" cohort; similarly, treat agencies classified into "low performer" group in both years as final "lower TPS" cohort; and treat agencies that switched between groups during the two years as final "middle TPS" cohort. The percentages were 15.1%, 14.3%, and 70.6% for each category, respectively. The distribution is similar in value-based purchasing (VBP) vs. Non-VBP states.

Below are the definitions for the patient demographics and social risk factors investigated in the high/low performers section:

- Age greater than 85: proportion of episodes with patients age greater than 85 in the HHA
- Black: proportion of episodes from Non-Hispanic black patients in the HHA
- Hispanic: proportion of episodes from Hispanic patients in the HHA
- Rural: proportion of episodes indicated as rural in the HHA
- Dual: proportion of episodes indicated as dual in the HHA
- Poverty: proportion of episodes among patients living in "high poverty" areas (defined as >=20% poverty in their area of residence) in the HHA

Note that we used 2018 data for all the above variables. Correlations for these demographics and social risk factors across years were also evaluated (range from 0.75 to 0.99).

A.4.2 Claims-Based Episodes

For observations that represent a claims-based home health episode, the data set provided claims-based episode information (e.g., episode type, therapy visits), HHA information, claims-based measures, MBSF-based beneficiary enrollment and chronic condition data, linked OASIS-based episode information (e.g., start date, end date, OASIS assessment ID), and OASIS assessment information (e.g., demographics, payment, inpatient diagnosis, timing). OASIS information was extracted from the overlapping OASIS-based episode with the earliest episode start date; the rationale behind this was that claims-based episodes were included in claims-based measure denominators based on episode start date, and our goal was to include OASIS information corresponding to the same measurement period.

A.4.3 OASIS-Based Episodes

For observations that represent an OASIS-based home health episode, the data set provided OASIS-based episode information (e.g., start date, end date, OASIS assessment ID), OASIS-based measures, OASIS assessment information (e.g., demographics, payment, inpatient diagnosis, timing), MBSF-based beneficiary enrollment and chronic condition data, linked claims-based episode information (e.g., episode type, therapy visits), and HHA information. Claim information was extracted from the overlapping claims-based episode with the latest episode start date; the rationale behind this was that OASIS-based episodes were included in OASIS-based measure denominators based on episode end date, and our goal was to include claims-based information corresponding to the same measurement period.

A.4.4 Construction of Unified File

The unification of the claims-based and OASIS-based home health episodes began with compiling the base data sources: claims-based episodes, OASIS-based episodes, and OASIS assessment-level data. For claims-based episodes, we maintained all episodes that began on or before 12/31/2018 and ended on or

after 01/01/2013. For OASIS-based episodes of care, we maintained all episodes with an end date from 2013 through 2018, including those with end reason for assessment equal to "Death" although these episodes were excluded from the HHVBP OASIS outcome measures. We maintained all OASIS assessments that were pulled from the CCW Oracle database, which covers assessments effective from 2009 through 2018; this ensured that we had all available assessments that could potentially be linked to a claims- or OASIS-based episode during our measurement period. Among these assessment-level records, we kept only the variables of interest to analyses in the Annual Report (see Section A.2.1.1 for list of variables pulled from OASIS assessments). Note that for OASIS-based data, the CCW beneficiary identifier was not always populated, presumably for a variety of reasons related to the beneficiary matching process and the wider scope of insurance coverage among OASIS beneficiaries (e.g. Medicare FFS, Medicare Advantage, Medicare and Medicaid, Medicaid only). For these episodes/assessments, we were unable to link to the CCW-based Medicare claims and enrollment data.

After compiling the basic data sources, we further processed the OASIS-based episodes to ensure there were no overlaps between episodes for the same patient (occurs for approximately 0.1% of all OASIS-based episodes). First, we removed any OASIS-based episodes that began and ended within a longer OASIS-based episode for the same patient. For example, if a patient had an OASIS-based episode that began on 01/01/2013 and ended on 12/31/2014, and also a shorter episode beginning on 12/23/2013 and ending on 12/26/2013, then the shorter episode beginning on 12/23/2013 would be excluded from further analyses. Second, if multiple OASIS-based episodes for the same patient overlapped in time, but did not meet previously defined exclusion criteria, then we truncated the end of the preceding episode so that the episode ended one day prior to the ensuing episode start date. Although each of these overlapped OASIS-based episodes may be included in HHVBP measure calculation individually, their overlapping nature are problematic when trying to link the OASIS-based episodes of care to their constituent claims-based episodes.

Next, we merged the claims-based episodes and OASIS-based episodes described in the preceding paragraphs based on CCW beneficiary ID and whether the episodes overlap in time. As a result, there could be 0, 1, or multiple OASIS-based episodes that link to one claims-based episode; likewise, there could be 0, 1, or multiple claims-based episodes that link to one OASIS-based episode. In the case, for example, when an OASIS-based episode overlapped with multiple claims-based episodes, the OASIS-based episode would be represented by a record for each of the overlapping claims-based episodes. If, for example, an OASIS-based episode does not link to any claims-based episodes, that OASIS-based episode would be represented by only one observation. Repeated observations for a particular episode, claims-based or OASIS-based, was de-duplicated in a later step.

For the purposes of assigning OASIS assessment data to each resulting linked episode, the set of episodes were conceptually categorized as follows: 1) claims-based episodes that overlap with at least one OASIS-based episode for the same beneficiary and ending prior to 01/01/2015; 2) claims-based episodes that overlap with at least one OASIS-based episode for the same beneficiary and ending on or after 01/01/2015; 3) claims-based episodes that do not overlap with an OASIS-based episode for the same beneficiary; 4) OASIS-based episodes that ended prior to 01/01/2015; and 5) OASIS-based episodes that ended on or after 01/01/2015. OASIS-based episodes were divided into groups based on episode end date due to an issue in the source assessment data, in which the assessment identifier for assessments effective prior to 2015 was not linkable to the assessment identifier provided in the QIES-based OASIS episode-level data. For these cases, there was a suitable alternative for linking the two

sources (described below), although not as accurate as linking by the assessment identifier itself. For assessments effective on or after 2015, the assessment identifier was consistent with the assessment identifier provided in the OASIS episode-level data, which meant these assessments were directly linkable to their corresponding episodes.

For episodes belonging to categories 1 and 4, the associated OASIS-based episode was linked to start and end OASIS assessments by matching on the following data elements: QIES state identifier, QIES resident identifier (uniquely identifies a patient when combined with state identifier), assessment effective date corresponding to OASIS episode start and end dates, assessment reason, and QIES provider identifier. For episodes belonging to categories 2 and 5, the associated OASIS-based episode was linked to an OASIS assessment by matching directly on the assessment identifier for the assessments corresponding to the start and end of the OASIS-based episode. For episodes belonging to category 3, we used assessment data elements derived from the claim treatment authorization code[51] submitted with each home health claim to link to the OASIS assessment submitted at the beginning of the claims-based episode of care. Because this linked assessment does not always represent a SOC/ROC, the next step was to trace back to the most recent SOC/ROC assessment previously submitted for that beneficiary, if possible. The goal of getting the assessment associated with the SOC/ROC was desirable because these assessment types required completion of more assessment items, as opposed to re-certification assessments (for example) which required fewer items to be completed.

The next step was to ensure that each record in the UAF uniquely represented a home health episode, whether sourced from claims or OASIS. For claims-based episodes that linked to multiple OASIS-based episodes, we only maintained the claims-based episode record that linked to the earliest OASIS-based episode based on start date. For OASIS-based episodes that linked to multiple claims-based episodes, we only maintained the OASIS-based episode record that linked to the latest claims-based episode based on start date. Episodes that linked to zero or one episode were also maintained in the data set as one record per episode. Thus, the resulting file contained one record for each claims- and OASIS-based episode occurring during the measurement period, where the vast majority of episodes had been linked to OASIS data based on previously described logic. Each episode's data source (claims vs. OASIS) was distinguished by a source indicator variable. The CY and quarter to which an episode was assigned was based on the episode start date for claims-based episodes, while for OASIS-based episodes, it was based on episode end date.

For each episode in the data set, we determined both the county in which care was provided (i.e. county of beneficiary residence) and also the state in which the HHA operates. For OASIS-based episodes and claims-based episodes that could be linked to an OASIS assessment, the beneficiary county was derived from the ZIP code reported on the start of care OASIS assessment. If beneficiary ZIP code was invalid or not available from a linked OASIS assessment and the episode is claims-based, then we used the ZIP code provided on the home health claim. If the ZIP code was invalid or unavailable on the linked OASIS assessment and home health claim, then we used the HHA's ZIP code as provided on the POS data set. The resulting ZIP code was mapped to one or more counties using the U.S. Department of Housing and Urban Development (HUD) ZIP-to-county crosswalk file. For cases where the ZIP code overlapped multiple counties, we selected the county that contained the largest proportion of the ZIP code

[51] For more information on treatment authorization code, see p. 54-55 of CMS Medicare Claims Processing Manual, Chapter 10. Accessible here.

population. For claims-based episodes that still did not have an associated county of beneficiary residence, we went through hierarchical logic spanning several data sources to determine the beneficiary residence at the time of the claims-based episode. This process is described in detail below in Section A.4.4.1. In order to determine the state in which an HHA operates, we used the first two digits of the HHA's CCN and referred to the current CMS CCN documentation.[52]

With the basic units of observation established, the rest of the UAF construction process involved adding data elements from various sources. The list below provides each of the data sources and a brief description of the associated data elements that were added to the UAF. For more detail on each of the data elements as they were incorporated in analyses, see Section A.3.

- Monthly Medicare FFS and dual eligibility indicators derived from the MBSF Base segment data; merged onto the UAF by beneficiary identifier and month
- Beneficiary enrollment and demographic data from the MBSF Base segment data; merged onto the UAF by beneficiary identifier and year
- Beneficiary chronic condition indicator variables derived from the MBSF Chronic Conditions segments data; merged onto the UAF by beneficiary identifier and year
- Various HHA-year level characteristics (e.g. chain affiliation, ownership type, count of episodes in year, etc.) sourced from POS data, PECOS and Cost Report data, and OASIS process measure data; merged onto the UAF by HHA CCN and year
- Home health claim-based data elements, either directly pulled from or derived from claim header and line item data; merged onto the UAF for only claims-based episodes using the CCW claim identifier
- OASIS-based episode-level outcome measure predicted probability and measure inclusion flags; merged onto the UAF for only OASIS-based episodes based on OASIS-based episode identifier
- Claims-based episode-level impact measure predicted probability and measure inclusion flags; merged onto the UAF for only claims-based episodes based on beneficiary identifier and episode start date
- OASIS process measure data received at the HHA-month level, but aggregated to the HHA-quarter level using an average weighted by episode count; merged onto the UAF based on HHA CCN and quarter
- County-level AHRF variables; merged onto the UAF based on beneficiary county of residence. See preceding two paragraphs in this section for information regarding how beneficiary county of residence was determined, as well as Section A.4.4.1 below for details on how that information was supplemented.
- The total number of Medicare eligible FFS beneficiaries are merged onto the UAF based on quarter in which the episode occurs (as defined by end date for OASIS episodes of care and start date for claims-based episodes) and beneficiary county of residence. See preceding two paragraphs in this section for information regarding how beneficiary county of residence was determined, as well as Section A.4.4.1 below for details on how that information was supplemented.

[52] See CMS Manual System Pub 100-07 State Operations Provider Certification - 2779A1. Accessed from here.

- Prior care setting indicator variables based on the 30 days prior to each episode; merged onto the UAF by episode identifier for all claims-based episodes and for OASIS-based episodes in which the beneficiary was full FFS enrolled for the entire 30-day lookback period
- OASIS-assessment items used for risk factor calculations; merged onto the UAF based on the linked OASIS assessment identifier for both the assessment that starts an episode and the assessment that ends an episode

Finally, we excluded all records in which the patient was treated by an HHA that operates in one of the U.S. territories or the District of Columbia (as determined by first two digits of CCN). The resulting UAF was used for all analysis reported in this report.

A.4.4.1 Identifying Beneficiary County of Residence

To supplement OASIS-based beneficiary ZIP code information used to determine county of residence, we constructed a process for identifying the county in which each home health claims-based episode occurred (i.e., beneficiary residence). The CBSA where services were provided is a claim line item, indicated by value code 61; in our analyses, this is considered the most reliable source of service location. However, in the case where the beneficiary lives in a rural area (outside of a CBSA), the line item only indicates the state of service; further, many CBSAs included multiple counties. To address these situations while still leveraging the accuracy of the CBSA for determining location of service, we followed a multi-step approach for determining the county in which services were provided during a home health episode:

1. Using the National Bureau of Economic Research's CBSA to Federal Information Processing Standards county crosswalk file, we mapped any valid CBSA code to one or more of its associated counties.
    a. If a non-rural CBSA mapped to one valid county, then the episode was associated with that county in analyses.
    b. If the line item indicated a rural area (i.e., no valid CBSA), or if the CBSA did not map to a single valid Federal Information Processing Standards county code, then we proceeded to the next step.
2. We next used patient ZIP code on the OASIS assessment nearest to the claims-based episode start date to determine the county where home health services were provided. We included any OASIS assessment within 90 days of the claims-based episode start date.
    a. For the selected OASIS assessment, we used the HUD ZIP to county crosswalk to map the county of service. For instances when the CBSA from Step 1 mapped to multiple counties, we ensured that the county derived from the OASIS assessment ZIP code matched one of the counties within the CBSA.
    b. For instances when the episode of care was provided in a rural area, we ensured that the county derived from the OASIS assessment ZIP code existed in the same state that was indicated by the claim line item value.
    c. If there were no OASIS assessments for the beneficiary within 90 days of the claims-based episode start date, *or* the county derived from the OASIS ZIP code did not align with the CBSA or rural area's state, then we proceeded to the next step.
3. Next, we examined the monthly beneficiary county of residence data from the MBSF for the month in which the claims-based episode ended.

   a. If the CBSA from Step 1 mapped to multiple counties, we maintained the county from the MBSF if it matched one of the counties within the CBSA.
   b. If services were provided in a rural area, we maintained the county from the MBSF provided that the corresponding state matched the state of the rural area.
   c. Otherwise, we proceeded to the next step.
4. We next examined the mailing address county associated with the home health claim. We applied the same logic as described in Step 3, but maintained the county from the claim (vs. MBSF).
5. Next, we examined the MBSF monthly beneficiary county of residence data, but expanded our search from Step 3 to include the 3 months preceding and following the month in which the home health episode ended. We applied the same logic as described in Step 3, giving higher priority to counties from months that were closer to and preceding the month in which the home health episode ended (e.g., 1 month before takes precedence over 2 months before, and also takes precedence over 1 month after). If none of the 6 months evaluated yielded a county that aligns with the CBSA or rural area, we proceeded to the next step.
6. Next, we examined the ZIP in which the HHA is located, sourced from the CCW's HHA facility files. Using the HUD ZIP code to county crosswalk file (as in Step 2), we mapped the associated county in which the HHA is located.
   a. If the CBSA from Step 1 mapped to multiple counties, then we assigned the HHA's county to the episode only if it matched one of the counties within the CBSA.
   b. If services were provided in a rural area, then we assigned the HHA's county to the episode only if the corresponding state matched the state of the rural area.
   c. Otherwise, we proceeded to the final step to determine the county in which services were provided.
7. Finally, to account for any remaining episodes that had not yet been assigned a county through this multi-step process (<10% of total episodes), we repeated Steps 2 through Step 5, but *without* enforcing that the county align with the CBSA or rural area state found on the claim.

A.5 Sensitivity Analyses

A.5.1 Expanded Covariate Adjustment

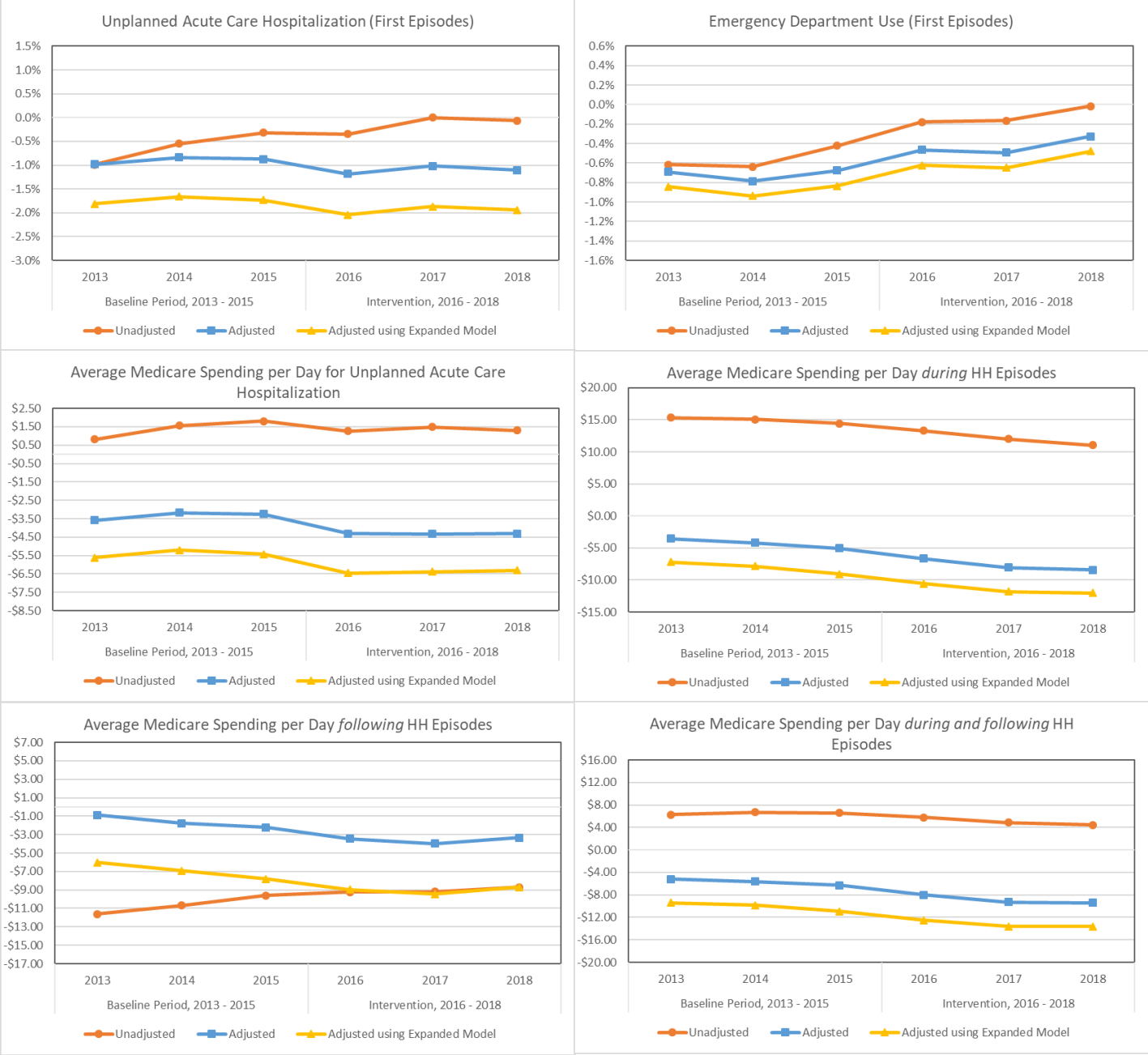
As shown in Exhibit A-6 in Section A.1.5, we noted that covariate adjustment with state fixed effects, as compared to no adjustment, helped in correcting for a lack of parallel trends between HHVBP and non-HHVBP states during the baseline period. In developing our approach to covariate adjustment, we conducted analyses of six claims-based impact measures to examine the impact of potentially expanding the list of covariates to include the HCC risk score (see Section A.2.1.2) and ESRD flag (defined in Section A.2.1.2) identified using Medicare claims. These impact measures included:

- Unplanned ACH among All FFS Home Health Episodes
- ED Use among First FF Home Health Episodes
- Average Medicare Spending per Day during FFS Home Health Episodes of Care
- Average Medicare Spending per Day following FFS Home Health Episodes of Care
- Average Medicare Spending per Day during and following FFS Home Health Episodes of Care
- Average Medicare Spending per Day for Unplanned ACH among All FFS Home Health Episodes

As shown in Exhibit C-4 in the Appendix of Supplemental Tables and Results, we observed that the HCC risk score and ESRD flag identified using Medicare claims were reasonably balanced overall between the HHVBP and non-HHVBP populations. However, given that these HCC risk scores (based off on 87 HCC as explained in Section A.2.1.2) and ESRD flags have a strong relationship with some of the impact measures, we included them in an expanded model for testing. Additionally, we added HCC score and ESRD flag to the existing list of covariates in our expanded adjusted model. As explained above in Section A.1.4, we computed the difference in means of the adjusted measure values using the expanded model between HHVBP and non-HHVBP across individual years. We display the results in Exhibit A-62 below using plots of the difference in yearly estimated mean values based on the expanded model as well as differences in yearly estimated mean values based on the unadjusted and original adjusted models (i.e., with the core set of covariates discussed in Section A.1.4).

In comparing the results corresponding to the two adjusted models, we observed that the model incorporating an expanded adjustment for claims-based chronic conditions did not generally help in achieving more parallel trends during the baseline period. As a result, we did not include claims-based chronic conditions as part of our core covariate adjustment for the impact measures being examined in this report. Instead, as discussed in Section A.1.5, we employed a D-in-D model that incorporated state-specific linear time trends for those impact measures where our falsification testing rejected the null hypothesis of parallel trends during the baseline period.

Exhibit A-62. Assessing Parallel Trends for Key Impact Measures Based on Unadjusted, Adjusted, and Expanded Models[53]



[53] The trend lines from the adjusted model (which includes an interaction term of the treatment indicator with each of the three levels of Ambulation and Locomotion along with other covariates and state fixed effects) are plotted on the assumption that the net effect of HHVBP on different levels of ambulation at the start of care is zero.

A.6 Glossary

Term	Definition
Claims-Based Episode of Care	Standard episode of HH care as defined by Medicare claims data. Each episode is 60 days or less and defined by clm_from_dt and clm_thru_dt reported on the claim.
PEP	Claims-based episodes subject to a Partial Episode Payment (PEP) are identified by patient discharge status code in the HH claims RIFs (PTNT_DSCHRG_STUS_CD) equal to 06.
LUPA	Claims-based episodes subject to a Low Utilization Payment Adjustment (LUPA) are identified by the LUPA indicator variable (CLM_HHA_LUPA_IND_CD) in the HH claims RIFs.
OASIS-Based Episode of Care	Standard episode of HH care as defined by OASIS assessments. Unlike claims-based episodes, OASIS episodes do not have time limits and can span years. Episode start is defined by the effective date of the SOC/ROC assessment that begins an episode. Episode end is defined by the effective date of the assessment indicating patient discharge, admission to inpatient facility, or death.
Outlier	Outlier payment adjustments are made for claims-based episodes representing a relatively high utilization of HH services. Episodes subject to an outlier payment are identified by the presence of a claim line value code (CLM_VAL_CD) equal to 17 in the HH claims RIFs.
Normal	A claims-based episode is considered normal if it did not receive a PEP, LUPA, or outlier payment adjustment.
FFS	A beneficiary is considered full FFS for a given month if they are enrolled in Medicare Parts A and B and are not receiving HMO coverage, based on MBSF monthly enrollment indicators.
Home Health Stay	A home health stay is a sequence of home health payment episodes separated from other home health payment episodes by at least 60 days.[19]
POS	Provider of Services (POS). Files can be downloaded from CMS website: https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Provider-of-Services/index
Predicted Probabilities	Episode-level values indicating the probability that the episode is included in the measure numerator, based on the measure-specific risk adjustment model.
Sequence of Episodes	Multiple claims-based episodes for the same beneficiary in which the subsequent episode starts within 60 days of the previous episode end date are considered to be part of the same episode sequence.
Sequence Start Date	Date on which the first episode in a sequence of claims-based episodes starts.
Sequence End Date	Date on which the last episode in a sequence of claims-based episodes ends.
Transfer HHAs within 60 Days	If a beneficiary has multiple claims-based episodes for different HHAs in which one episode starts within 60 days of the previous episode, the first episode is flagged to indicate a transfer of HHAs within 60 days. These flagged episodes are excluded from the denominator of several measures in this report.
VRDC	CMS offers a secure way of accessing its program data through virtual access to the CMS Virtual Research Data Center (VRDC). The CMS VRDC is a virtual research environment that provides timelier access to Medicare and Medicaid program data in a more efficient and cost effective manner. Researchers working in the CMS VRDC will have direct access to approved data files and be able to conduct their analysis within the CMS secure environment.

Appendix B: Qualitative Technical Appendix

This year, we conducted three sets of interviews: one set of interviews with home health chain organizations and two sets of interviews with home health agencies (HHAs). The interviews with home health chain organizations explored how chain affiliation impacts Home Health Value-Based Purchasing (HHVBP)-related quality improvement activities in both HHVBP and non-HHVBP states. The first set of interviews with HHAs examined agencies' responses to incentives to improve the two HHVBP claims-based measures: unplanned acute care hospitalization (ACH) and emergency department use without hospitalization (ED). The second set of interviews with HHAs examined effects of preferred networking arrangements: alternative payment models (APMs) and Medicare Advantage (MA) on the delivery of home health care. Below we describe the methods that we used to conduct all three sets of interviews.

B.1 Interviews with Home Health Chain Organizations Operating in Both HHVBP and Non-HHVBP States: Investigating Potential for Spillover into Non-HHVBP States

In this section, we present the findings of 25 interviews that we conducted between May and July of 2019 via telephone with home health chain organizations operating in both one or more of the nine intervention states and at least one non-intervention state. We asked key corporate leaders at these chains to discuss: 1) general corporate structure as it relates to the management and relationships for home health agency operations, 2) management structure as it applies to the organization's approach to performance improvement activities undertaken in response to the HHVBP model, 3) other factors influencing the organization's quality and performance improvement strategy, and 4) the extent to which corporate initiatives and activities to improve outcomes in response to HHVBP were rolled out to owned and/or affiliated agencies in non-HHVBP states.

B.1.1 Sampling and Outreach for Interviews with Home Health Chain Organizations

We identified chains using a chain indicator in the evaluation analytic file developed by Arbor Research. The chain indicator identified chain-affiliated agencies and made it possible to calculate the number of agencies and Outcome and Assessment Information Set (OASIS) episodes for each organization during our study period. The goal of the sampling strategy was to interview a diverse set of chain organizations to understand:

1. Whether chain organizations implemented HHVBP-specific staffing, activities, trainings, or other operational changes specifically in response to HHVBP, and
2. Whether changes in operations geared toward performance under HHVBP were similar among chain HHAs in VBP and non-VBP states

We selected an initial target sample of large chains by evaluating organizations in descending order of 2017 episodes, until the sample contained 15 potential interviewees. We excluded chains identified in the analytic file that were part of a hospital system or operated by a management services organization, chains operating only in one state or having no HHVBP-state presence, and chains that recently merged with or were acquired by another large chain. We also selected a sample of "non-large" chains to interview through stratified random sampling. We sorted organizations into three strata to achieve diversity in the 1) number of agencies in HHVBP-states, 2) share of an organization's agencies in HHVBP states (as a fraction of the organization's total), and 3) number of HHVBP states in which an organization operates. We then applied the same exclusion criteria as above. We selected as close to an equal number of organizations from each stratum. We contacted and interviewed 27 representatives from 14 large chains and 13 non-large chains. However, two non-large chain interviews conducted were excluded from the analysis due to agency self-reported affiliations with hospital systems previously unidentified in evaluation analytic file data. Therefore, we ultimately analyzed 25 interviews from 14 large chains and 11-non-large chains.

We obtained corporate contact information from national associations contacts, PPOC data for the HHVBP evaluation, and internet searches. Each interview slot was assigned to an interview team consisting of a lead interviewer and a note-taker, both of whom were trained on the outreach materials

and discussion guide. We contacted corporate representatives via telephone and email to invite them to voluntarily participate in the interviews. During the outreach and scheduling process, the interview team explained the topics that would be covered and requested that the corporate point of contact identify the most appropriate interview participant(s) in their organization. In conducting outreach, if we found that an organization that did not meet our inclusion criteria, we replaced it. Some agencies selected to be interviewed ultimately did not participate for the following reasons:

- Declined to be interviewed
- Failed to respond to multiple outreach attempts from the team
- Failed to attend the scheduled interview times to which they had agreed

In total, 31 home health chain organizations were contacted in order to yield the 25 interviews, resulting in a response rate of 81%.

B.1.2 Data Collection and Analysis for Interviews with Home Health Chain Organizations

We used a semi-structured discussion guide to conduct the interviews. The Centers for Medicare and Medicaid Services (CMS) reviewed and approved the guide. We audio recorded the majority of interviews with permission of the interviewee.

The interview team spoke with a wide variety of corporate staff. While their titles and positions varied across organizations, we generally spoke with corporate leaders working on clinical strategy and services (e.g., corporate chief nursing officers, division directors of clinical services), serving as vice presidents of home health service lines, or leading or working with their organization's corporate quality team (e.g., senior directors/vice presidents of quality). While we conducted most interviews with one participant from a chain organization, we conducted some interviews with several participants from the same chain. Each interview lasted approximately 30-45 minutes.

The team produced transcript-style notes for each interview in a note-taking template that mirrored the discussion guide. The team retained recordings and the raw notes for backup. Lead interviewers summarized key observations and findings, qualifications, and important differences between large and non-large organizations or other key organizational characteristics by theme. Two senior members of the evaluation team identified key themes across all the transcript-style interview notes and summarized each interview by theme, impressions, and takeaways in an Excel database. The same senior members of the evaluation team facilitated a debriefing with all lead interviewers and major note-takers to independently hear their impressions, and to confirm and further refine the themes to be included in the Report. Quotations taken from the transcript-style notes were selected to demonstrate common themes or interesting insights and were reviewed by team members for quality and illustrative value.

B.2 HHA Interviews: TPS Weighting Changes to the Two Claims-Based Measures

Between July and October 2019, our interview team conducted 53 interviews via telephone with HHAs in the nine HHVBP states. We selected agencies that fell into three types of Total Performance Score categories with regard to the two HHVBP claims-based measures: 1) high achievers, 2) high improvers, and 3) low achievers (more detail on these categories is provided below). We asked HHA representatives to discuss: 1) what types of initiatives agencies used to improve their unplanned hospitalization and ED measures or achieve low rates of use, 2) if agencies had made operational changes to affect these rates prior to 2019, 3) if agencies are planning changes given greater weight to the claims-based measures, and 4) and what specific types of efforts they are planning. Additionally, in order to contextualize our conversations with HHAs, we also asked them to discuss: 5) general background information regarding the HHA, 6) their awareness and perception of CMS' announced changes to the reweighting of the ACH and ED measures, and 7) external factors that might impact an agency's approach to or performance on these measures.

B.2.1 Sampling and Outreach for TPS Weighting Change Interviews with HHAs

Within each state, we selected agencies to interview by using achievement and improvement scores for the two HHVBP claims-based measures that were calculated as part of the 2017 TPS and were used to adjust payments in 2019. Because of variation in the ACH and ED rates across the HHVBP states, HHVBP achievement and improvement scores that were calculated as part of the TPS in performance year 2 (2017) were used to ensure that we sampled agencies for interviews in all HHVBP states. The sampling categories were defined as follows:

1. High achievers: High ACH or ED achievement (i.e., achievement score of 10 on at least one of the measures)
2. High improvers: High ACH or ED improvement (i.e., improvement score >8 on at least one of the measures, agencies with a score of 10 are high achievers and thus were excluded)
3. Low achievers: Low ACH or ED achievement (i.e., achievement score of 0 on both measures, improvement score <5 on both measures)

Due to the small number of agencies in some of the nine HHVBP states, it was difficult to obtain agencies that were high improvers or high achievers on both of the claims-based measures. As a result, many agencies selected were high improvers or high achievers in one of the measures, but not both. For sampling and analytic purposes, high improvers and high achievers were grouped together if they had a high score on either the ACH or ED improvement measure, the ACH or ED achievement measure, or both measures within the achievement or improvement category. Interviews were allocated across the nine HHVBP states, with relatively more interviews allocated to Florida and fewer to Maryland, Nebraska, and Washington to reflect the relative number of agencies in each state. Due to a low response rate across all agency categories, the team interviewed significantly more low achieving agencies than agencies in the other categories; this was due to significantly more agencies falling into that category and thus being eligible for our sample. The distribution of interviewed agencies by performance category and state is shown in Exhibit B-1.

Exhibit B-1. Count of Agency TPS Weighting Change Interviews by HHVBP State and Performance Category

State	High Achievers	High Improvers	Low Achievers	Total
AZ	1	1	4	6
FL	2	3	5	10
IA	5	1	1	7
MA	2	2	2	6
MD	2	0	2	4
NC	3	0	1	4
NE	1	0	4	5
TN	0	0	6	6
WA	1	2	2	5
Total	**17**	**9**	**27**	**53**

Note: A majority of the agencies in the high achievement category only had high scores on one of the achievement measures.

We obtained agency contact information from the PPOC list provided by the HHVBP Technical Assistance contractor and refined the list using internet searches, as necessary. Each interview slot was assigned to an interview team consisting of a lead interviewer and a note-taker, who were trained on the outreach materials and discussion guide. We contacted agencies via telephone and email to invite them to voluntarily participate in the interviews. During the outreach and scheduling process, the interview team explained the topics that would be covered and requested that the agency identify the most appropriate interview participant(s).

Some agencies selected to be interviewed ultimately did not participate for the following reasons:

- Declined to be interviewed
- Failed to respond to multiple outreach attempts from the team
- Failed to attend the scheduled interview times to which they had agreed

We replaced agencies that declined or who did not respond after repeated outreach; these were replaced with agencies from the same performance category in the same HHVBP state. In total, 155 HHAs were contacted in order to yield the 53 interviews, resulting in a response rate of 34%.

In addition to the breakdown by performance category and state detailed above in Exhibit B-1, Exhibit B-2 lists agency characteristics among the population of HHAs that we interviewed. This information provides an overall picture of the composition of interviewees to facilitate interpretation of the interview data. The respondents had the following key characteristics:

Exhibit B-2. Agency Characteristics for TPS Weighting Change Interviewees

Agency Characteristics	Characteristic Subcategories	Number of Agencies (Total=53)	Percentage of Agencies
Location Type*	Rural	22	41.5%
	Urban	27	50.9%
	Suburban	4	7.5%
Ownership Status	For-profit	28	52.8%
	Non-profit	21	39.6%

Agency Characteristics	Characteristic Subcategories	Number of Agencies (Total=53)	Percentage of Agencies
	Government	4	7.5%
Setting	Freestanding	43	81.1%
	Hospital-based	10	18.9%
Chain Status	Part of a chain	15	28.3%
	Not part of a chain	38	71.7%

**For the location type, we used categories that were self-reported by interview respondents. For this reason, suburban is included, in addition to rural and urban.*

B.2.2 Data Collection and Analysis for TPS Weighting Change Interviews with HHAs

We used a semi-structured discussion guide to conduct the interviews. CMS reviewed and approved the guide. We audio recorded the majority of interviews with permission of the interviewee.

The interview team spoke with agency staff that we identified as falling into two categories: non-clinical management and clinical management. We define non-clinical management staff as not having an exclusive focus on clinical activities or quality improvement. Non-clinical management titles included branch managers, administrators, executive directors, and owners. We define clinical management staff as having an exclusive focus on clinical activities or quality improvement. Clinical management titles included Director of Nursing, Clinical Manager, and Quality Assurance Coordinator. While most interviews were conducted with one participant from an agency, some interviews were conducted with several participants from the same agency. Each interview lasted approximately 30-45 minutes.

The team produced transcripts for each interview which were incorporated into a note-taking template organized by topics in the discussion guide in order to facilitate data analysis. The team retained recordings and the raw notes for backup. The templates were loaded into qualitative data analysis software (Dedoose), a secure, Web-based application that facilitates aggregation and storage of data by a broad team of users, allowing immediate access and real-time data sharing, with tight controls for access levels and version management. Within Dedoose, we linked each interview with key characteristics of that agency: performance type (high achiever, high improver, low achiever) and agency characteristics listed in Exhibit B-2 to facilitate analyses across types of respondents.

Once the data were in Dedoose, the team used a codebook with a defined list of key themes to code each interview. Before finalizing, the team tested the codebook multiple times across several interview transcripts, identifying and refining codes that yielded inconsistent applications or that required further disaggregation or consolidation. During this testing period, codes with lower agreement across coders were re-assessed to determine if they could be consolidated with other existing codes.

Once all interviews were coded, a senior member of the evaluation team analyzed the interview data, including assessment of frequency of codes, and systematic review and synthesis of interview excerpts that were coded to the same code. This process enabled identification of common themes and also infrequent but important findings that facilitate a better understanding of agencies' responses within certain contexts. When analyzing responses across the three performance categories or agency characteristics, we examined the frequency of a response within a category and then compared these

frequencies across categories. The write-up was reviewed by the rest of the interview team to ensure agreement on the key themes and to confirm and further refine the themes to be included in the Report. Quotes taken from the transcripts were selected to demonstrate common themes or interesting insights and were reviewed by team members for quality and illustrative value.

B.3 HHA Interviews: Alternative Payment Models

Between July and October of 2019, we conducted 30 telephone interviews with HHAs in 12 counties (six counties in intervention states, six counties in non-intervention states). We selected counties with high APM activity, defined by the presence of MA plans, the Bundled Payments for Care Improvement (BPCI) initiative, Comprehensive Care for Joint Replacement (CJR) model, and accountable care organizations (ACOs). [54] Once counties were identified, 15 agencies from the six counties were randomly selected for both HHVBP and non-HHVBP counties. We asked HHA representatives to discuss: 1) a description of their market including the presence and impact of managed care, ACOs, and other APMs and 2) how the presence of APMs affects agencies' operations, financial viability, delivery of care, and performance.

B.3.1 Sampling and Outreach for APM Interviews with HHAs

To assess the level of activity in a county, we tabulated data on Center for Medicare & Medicaid Innovation (CMMI) ACO model participation, MA penetration, BPCI and CJR participation, and Medicare Shared Savings Program (MSSP) ACO presence by county in HHVBP and non-HHVBP states and ranked counties to identify those with the greatest concentration of activity. Next, we selected six counties with high activity of MA/ACO/BPCI/CJR and ensured that the selected counties had a mixture of high MA penetration, multiple (and multiple types of) payment innovations, and varied geographic areas (in terms of size and state). We carefully considered selecting at least one rural county; however, we found very few rural counties met the criteria of high MA penetration and high payment/delivery innovation, suggesting that interviews would yield little information. After selecting counties in HHVBP states, we used the information to identify roughly comparable counties in non-HHVBP states, selecting from within the comparison state groupings.

Once the counties in HHVBP and non-HHVBP states were identified, we targeted two to three agencies in each county for interviews. In total, we chose 15 agencies in HHVBP and non-HHVBP states under the assumption that an even division of interviews in HHVBP vs. non-HHVBP states allows us to better understand the impact of HHVBP and how it may differ across agencies. Targeted interviews and actual interviews differ slightly as we had to replace some agencies that declined the interview or who did not respond after repeated outreach. County selection, APM activity criteria, target interviews, and actual interviews for HHVBP and non-HHVBP states are shown in Exhibit B-3. In aggregate, the HHAs selected for interviews have similar agency characteristics as all HHAs in the counties with the exception of chain status for non-HHVBP HHAs and size for both HHVBP and non-HHVBP agencies (Exhibit B-4). Specifically, there is a larger proportion of chain-affiliated HHAs selected for interviews compared to all HHAs in the non-HHVBP counties. Related to the size of the agencies, smaller agencies were less responsive to outreach attempts and the limited pool of agencies in certain selected counties made it difficult to select replacements of similar size. In total, 76 HHAs were contacted in order to yield the 30 interviews, resulting in a response rate of 39%.

[54] The data available for the ranking includes only raw counts of initiatives rather than number of participating Medicare beneficiaries.

Exhibit B-3. Selected Counties with High MA Penetration and High Innovation Activity in HHVBP and Non-HHVBP States

	State	County	Target Interviews	Actual Interviews	HHAs	CMMI ACOs	MSSP ACOs	BPCI Initiatives	CJR Hospitals	% MA
HHVBP	FL	Miami-Dade	3	2	254	1	6	20	16	66.3%
	MA	Middlesex	3	3	106	2	2	20	0	25.0%
	AZ	Maricopa	3	4	90	2	4	50	0	42.1%
	TN	Davidson	2	2	27	2	7	13	2	41.4%
	FL	Pasco	2	2	49	0	5	7	6	52.7%
	NC	Guilford	2	2	19	2	1	3	0	30.5%
Non-HHVBP	TX	Harris	3	3	565	3	13	31	0	45.9%
	CT	Fairfield	3	4	45	1	2	28	0	29.1%
	NV	Clark	3	3	119	0	3	26	0	40.5%
	MI	Genesee	2	2	69	0	3	3	2	48.0%
	LA	Orleans Parish	2	2	34	0	2	4	2	51.2%
	AL	Jefferson	2	1	23	0	3	6	0	52.0%

ACOs= Accountable Care Organizations; BPCI = Bundled Payments for Care Improvement; CJR = Comprehensive Care for Joint Replacement; CMMI = Center for Medicare & Medicaid Innovation; HHAs= Home Health Agencies; HHVBP = Home Health Value-Based Purchasing; MA = Medicare Advantage; MSSP = Medicare Shared Savings Program

Exhibit B-4. Characteristics in Selected Counties vs. Subset of Agencies Selected for Interviews (2018 Data)

	Percentage of Total HHAs	Percentage of HHAs Interviewed	Percentage of Total HHAs	Percentage of HHAs Interviewed
	In HHVBP Counties		In Non-HHVBP Counties	
For-profit	88.4%	93.3%	92.6%	100%
Freestanding	97.5%	100%	98.6%	100%
Chain	13.7%	26.7%	7.9%	26.7%
Size Quartiles*				
Small	27.2%	0%	36.7%	13%
Mid-Small	20.6%	29%	27.4%	7%
Mid-Large	21.5%	14%	20.4%	40%
Large	24.8%	57%	14.3%	40%

**Size quartiles were generated in SAS using the RANK procedure. Also note that one of the selected HHAs from Middlesex County in Massachusetts had missing values for the claim-based episodes. Therefore, the size column for HHVBP agencies selected totals ~93%. HHAs= Home Health Agencies; HHVBP = Home Health Value-Based Purchasing*

Each interview slot was assigned to an interview team consisting of a lead interviewer and a note-taker, both of whom were trained on the outreach materials and discussion guide. The team contacted each HHA by email and/or telephone. During the outreach and scheduling process, the interview team explained the topics that would be covered and requested that key personnel be available to participate. Based on discussion topics, the contacts at the HHA determined who would be able to respond to the interview questions. As noted above, some agencies selected to be interviewed ultimately did not participate in the interviews, for the following reasons:

- Declined to be interviewed
- Failed to respond to multiple outreach attempts from the team
- Failed to attend the scheduled interview times to which they had agreed

When any of these issues arose, the interview team selected an alternate agency in the state to contact with similar characteristics (i.e., ownership, chain status, freestanding vs. hospital-based).

B.3.2 Data Collection and Analysis for APM Interviews with HHAs

We used a semi-structured discussion guide to conduct the interviews and audio recorded the majority of interviews with permission of the interviewee. CMS reviewed the guide and we revised it to incorporate their feedback.

We audio recorded the majority of interviews with permission of the interviewee. The interview team spoke with a wide variety of agency staff; while their titles varied across agencies, in general, we spoke with key informants who were the administrator for their agency (e.g., administrators and branch managers), worked on clinical services (e.g., clinical directors), or worked on the quality team (e.g., quality improvement managers). Each interview lasted approximately 20 to 45 minutes.

The team produced transcript-style notes for each interview in a note-taking template that mirrored the discussion guide; the template helped to reinforce consistency in data collection and kept the gathered information well-organized. The team retained recordings and the raw notes for backup purposes, and used the discussion guide to create a framework for data aggregation and analysis in Excel. Three members of the evaluation team identified key themes across all of the transcript-style interview notes and made an Excel database with key themes and topics. A senior member of the evaluation team facilitated a debriefing with all lead interviewers and note-takers to hear their impressions, and to confirm and further refine the themes to be included in the database and ultimately the Report. Once themes were finalized, the members of the evaluation team reviewed each interview and input the findings into an Excel database by topic. Quotations taken from the transcript-style notes were selected to demonstrate common themes or interesting insights and were reviewed by team members for quality and illustrative value. The findings from the Excel database form the basis of the results presented in the body of this Report.

Appendix C: Supplemental Tables and Results

C.1 Characteristics of HHAs and Patients

Exhibit C-1. HHA Characteristics in 2013 – 2018, by Year, All HHVBP States, and All Non-HHVBP States

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Total number of HHAs	2,584	2,413	2,301	2,192	2,119	2,035	1,982	10,446	9,869	9,871	9,707	9,557	9,179	8,934
Received a TPS score					76.6%	79.7%	81.0%							
Ownership														
For-profit	80.6%	79.4%	79.0%	78.5%	78.2%	78.4%	79.2%	80.3%	79.5%	79.9%	80.1%	80.6%	81.2%	82.0%
Non-profit	13.7%	14.5%	14.5%	14.9%	15.3%	15.5%	15.4%	15.0%	15.5%	15.3%	15.4%	15.3%	15.3%	14.6%
Government-owned	5.7%	6.1%	6.5%	6.6%	6.5%	6.1%	5.4%	4.8%	5.0%	4.8%	4.5%	4.2%	3.5%	3.4%
Setting														
Hospital-based	7.7%	8.1%	8.4%	8.6%	8.2%	8.0%	7.8%	9.3%	9.8%	9.2%	8.6%	8.1%	7.7%	7.3%
Freestanding	92.3%	91.9%	91.6%	91.4%	91.8%	92.0%	92.2%	90.7%	90.2%	90.8%	91.4%	91.9%	92.3%	92.7%
Chain Affiliation														
Chain affiliated	25.5%	27.0%	28.6%	29.8%	31.2%	32.6%	33.9%	17.7%	18.4%	18.5%	19.4%	20.3%	20.7%	21.7%
No chain affiliation	62.2%	61.3%	61.6%	62.7%	62.4%	62.9%	64.3%	72.2%	72.6%	72.8%	72.8%	73.0%	75.1%	76.5%
Chain affiliation missing	12.3%	11.7%	9.9%	7.5%	6.4%	4.5%	1.8%	10.1%	8.9%	8.7%	7.8%	6.7%	4.1%	1.8%
HHA Age														
HHA age < 4 years	31.8%	27.5%	20.7%	17.9%	15.7%	12.6%	9.9%	27.8%	24.0%	19.7%	16.2%	13.1%	10.3%	8.8%
HHA age 4-10 years	30.7%	32.8%	36.2%	35.5%	33.2%	32.2%	31.0%	31.6%	33.2%	35.5%	36.4%	36.3%	35.0%	32.3%
HHA age > 10 years	37.5%	39.7%	43.2%	46.6%	51.1%	55.2%	59.1%	40.6%	42.8%	44.7%	47.4%	50.6%	54.7%	58.9%
HHA Size														
1-59 OASIS Episodes	22.8%	19.5%	18.8%	19.6%	19.8%	20.7%	20.1%	28.6%	25.9%	27.1%	27.0%	27.4%	26.5%	26.0%

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
60-249 OASIS Episodes	28.8%	29.5%	28.8%	27.1%	26.7%	23.9%	23.2%	33.4%	34.4%	33.8%	33.0%	31.3%	30.9%	30.2%
250-499 OASIS Episodes	17.5%	18.4%	19.0%	17.4%	16.4%	16.2%	16.6%	15.8%	16.5%	16.3%	16.1%	16.2%	15.6%	15.7%
500-999 OASIS Episodes	14.0%	14.7%	15.1%	16.1%	15.2%	15.7%	14.7%	10.9%	11.4%	10.9%	11.1%	11.5%	12.3%	12.6%
≥1,000 OASIS Episodes	16.9%	17.9%	18.2%	19.8%	21.9%	23.6%	25.3%	11.3%	11.8%	11.9%	12.7%	13.6%	14.7%	15.5%
Profitability*														
Profit margin <0%	26.2%	26.8%	27.5%	24.0%	23.5%	25.2%	N/A	29.6%	30.8%	32.1%	25.8%	25.6%	25.2%	N/A
Profit margin 0-10%	16.0%	17.1%	16.8%	14.1%	13.0%	13.1%	N/A	18.0%	19.1%	18.2%	16.7%	17.0%	16.2%	N/A
Profit margin >10%	57.8%	56.1%	55.7%	61.9%	63.5%	61.7%	N/A	52.4%	50.1%	49.7%	57.5%	57.4%	58.6%	N/A

These numbers reflect all HHAs with at least one OASIS episode or Medicare claims episode in a given year, regardless if the HHA received a TPS in 2018.

** The number of HHAs used to calculate profitability margins is a subset of all HHAs, given incomplete and/or missing Medicare Cost Report data and the trimming methodology employed to calculate the variable (See Section A.2.1.3 of the Quantitative Technical Appendix for more detail). For example, among the 2,413 HHVBP and 9,869 non-HHVBP HHAs in 2013, only 1,576 and 6,750, respectively, had Cost Report data that could be used to estimate profitability.*

Exhibit C-2. OASIS Home Health Beneficiary Characteristics in 2013 – 2018, by Year, All HHVBP States, and All Non-HHVBP States

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Total number of home health patients with an OASIS episode*	2,229,171	985,162	982,182	997,339	1,004,442	1,029,738	1,020,126	7,430,750	3,203,609	3,243,101	3,334,998	3,378,010	3,504,885	3,434,048
Total number of OASIS episodes	4,507,454	1,492,977	1,491,050	1,523,427	1,564,741	1,603,924	1,673,531	14,680,726	4,772,109	4,860,358	5,048,259	5,239,428	5,447,066	5,605,854
Average age	75.5	75.4	75.4	75.5	75.6	75.8	75.9	74.4	74.5	74.3	74.4	74.5	74.6	74.8
Female	61.4%	61.7%	61.4%	61.1%	60.9%	60.6%	60.3%	61.6%	61.9%	61.6%	61.3%	61.1%	60.8%	60.6%
Race/Ethnicity														
Hispanic (regardless of race)	8.9%	9.9%	9.0%	7.8%	7.5%	7.0%	7.4%	7.2%	7.2%	7.2%	7.1%	7.1%	7.1%	7.1%
Black, non-Hispanic	10.6%	10.5%	10.6%	10.8%	11.1%	11.3%	11.3%	14.9%	15.1%	15.0%	14.7%	14.5%	14.2%	14.2%
White, non-Hispanic	78.9%	78.1%	78.9%	79.8%	79.7%	80.0%	79.5%	74.7%	74.6%	74.7%	74.9%	75.1%	75.4%	75.2%
Other, non-Hispanic	1.4%	1.3%	1.4%	1.5%	1.6%	1.6%	1.7%	3.0%	2.9%	3.0%	3.0%	3.1%	3.2%	3.3%
Multiracial, non-Hispanic	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Rural	4.3%	4.4%	4.3%	4.3%	4.2%	4.3%	4.1%	7.3%	7.4%	7.3%	7.2%	7.2%	7.1%	7.1%
Insurance														
% Dual eligible	27.3%	28.7%	27.4%	25.9%	24.9%	24.2%	23.1%	26.8%	27.3%	26.8%	26.2%	25.6%	25.8%	25.2%
% Medicaid only (either managed care or FFS without dual)	4.1%	3.7%	4.2%	4.4%	4.6%	4.4%	4.2%	6.0%	5.5%	6.1%	6.3%	6.3%	6.1%	6.0%

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Persons aged ≥25 years with less than high-school (HS) diploma in the beneficiary's county	12.6%	12.7%	12.6%	12.4%	12.3%	12.3%	12.3%	13.8%	13.9%	13.8%	13.7%	13.7%	13.7%	13.6%
Change in % of home health beneficiaries from previous year	N/A	N/A	-0.3%	1.5%	0.7%	2.5%	-0.9%	N/A	N/A	1.2%	2.8%	1.3%	3.8%	-2.0%

These numbers reflect all OASIS episodes in the CY, regardless if their HHA received a TPS in 2018.

** Number of home health patients with an OASIS episode for 2013-2015 represent unique number of patients in that 3 year period.*

Exhibit C-3. OASIS Clinical Factors in 2013 – 2018, by Year, All HHVBP States, and All Non-HHVBP States

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Total number of OASIS episodes	4,512,807	1,494,068	1,492,348	1,526,391	1,566,552	1,605,302	1,674,602	14,698,538	4,777,321	4,865,104	5,056,113	5,252,923	5,467,520	5,609,814
Discharged from inpatient facility in last 14 days	67.8%	67.1%	67.4%	68.8%	68.8%	69.4%	69.2%	71.4%	71.5%	71.3%	71.5%	71.3%	71.5%	71.1%
Receiving psychiatric nursing services	2.1%	2.3%	2.1%	2.1%	1.9%	1.6%	1.5%	1.4%	1.5%	1.4%	1.4%	1.3%	1.2%	1.1%
Neoplasm diagnosis	8.1%	8.0%	8.1%	8.2%	8.5%	8.6%	8.7%	8.7%	8.7%	8.7%	8.6%	8.9%	8.9%	9.0%
Requires urinary catheter	4.4%	4.3%	4.4%	4.4%	4.5%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.7%	4.6%
Requires oxygen therapy	14.3%	14.6%	14.1%	14.1%	13.8%	13.7%	13.0%	16.2%	16.6%	16.1%	15.8%	15.6%	15.4%	14.8%
Orthopedic diagnosis	43.0%	43.5%	43.4%	41.9%	39.3%	37.8%	37.1%	38.4%	38.0%	38.6%	38.5%	37.3%	36.8%	36.5%
Non-surgical wound or skin lesion	23.1%	20.8%	23.6%	24.8%	26.5%	26.5%	25.8%	24.1%	22.8%	24.8%	24.7%	25.1%	25.2%	25.3%
Surgical wound	24.4%	24.0%	24.4%	24.7%	25.4%	25.5%	25.5%	25.6%	25.2%	25.9%	25.8%	26.3%	26.6%	26.7%
Ambulation-Locomotion														
Able to independently walk and needs no human assistance or assistive device	4.7%	5.6%	4.5%	4.1%	3.2%	2.4%	2.1%	5.0%	5.8%	5.0%	4.2%	3.3%	2.6%	2.1%
Able to independently walk with the use of a one-handed device	9.1%	10.7%	9.0%	7.7%	5.8%	4.3%	3.6%	10.1%	11.6%	10.1%	8.8%	7.0%	5.5%	4.6%
Requires two handed device or human assistance	32.3%	35.9%	32.5%	28.7%	22.5%	17.7%	14.9%	32.8%	35.2%	33.0%	30.3%	26.1%	22.4%	19.1%
Walks only with supervision or assistance from another at all times	42.6%	37.0%	42.8%	47.9%	55.8%	61.9%	65.3%	40.2%	35.8%	40.1%	44.6%	50.9%	56.3%	60.5%
Chairfast to bedfast	11.2%	10.8%	11.2%	11.6%	12.6%	13.6%	14.1%	11.9%	11.7%	11.9%	12.1%	12.7%	13.3%	13.7%

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Pressure Ulcer														
Pressure Ulcer Stage 2	3.2%	3.2%	3.2%	3.2%	3.0%	2.9%	3.0%	3.4%	3.5%	3.4%	3.3%	3.2%	3.0%	3.1%
Pressure Ulcer Stage 3	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%	0.8%	1.0%	1.0%	1.0%	1.0%	1.0%	0.9%	0.9%
Pressure Ulcer Stage 4	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
Pressure Ulcer Not Stageable	0.9%	0.9%	0.9%	1.0%	1.0%	1.0%	1.0%	1.1%	1.0%	1.0%	1.1%	1.1%	1.0%	1.1%
Risk for Hospitalization*														
Multiple hospitalizations in past 6 months	36.4%	37.4%	38.4%	33.6%	32.0%	32.2%	32.3%	37.1%	38.7%	38.9%	34.0%	32.2%	32.5%	32.5%
History of falls	32.8%	31.6%	33.5%	33.4%	33.6%	34.7%	35.1%	31.4%	30.8%	31.9%	31.6%	31.6%	32.3%	32.9%
Currently taking 5 or more medications	88.3%	87.6%	87.8%	89.5%	91.1%	92.1%	92.3%	87.0%	86.2%	86.6%	88.2%	90.0%	91.6%	92.0%

These numbers reflect all OASIS episodes in the CY, regardless if their HHA received a TPS in 2018.

**Categories for this condition are not mutually exclusive*

Exhibit C-4. FFS Home Health Beneficiary Characteristics in 2013 – 2018, by Year, All HHVBP States, and All Non-HHVBP States

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Total number of beneficiaries with Medicare FFS home health claims*	1,841,223	850,868	834,565	840,408	833,486	820,040	815,891	7,898,642	2,631,986	2,618,829	2,647,827	2,659,592	2,606,539	2,553,363
Total number of FFS episodes	4,422,930	1,501,589	1,460,096	1,461,245	1,430,348	1,402,802	1,399,939	15,417,548	5,173,186	5,113,875	5,130,487	5,080,946	4,916,118	4,776,305
Average age (years)	77.0	76.8	77.0	77.2	77.3	77.5	77.6	75.8	75.8	75.8	76.0	76.1	76.2	76.3
Female	62.1%	62.5%	62.0%	61.7%	61.4%	61.0%	60.6%	62.8%	63.2%	62.7%	62.4%	62.1%	61.7%	61.3%
Race/Ethnicity														
Hispanic (regardless of race)	9.5%	10.9%	9.6%	7.9%	6.8%	6.0%	6.0%	8.5%	8.8%	8.5%	8.2%	7.9%	7.8%	7.5%
Black, non-Hispanic	10.1%	10.1%	10.0%	10.2%	10.2%	10.2%	10.0%	16.5%	17.1%	16.6%	15.8%	14.8%	14.1%	13.5%
White, non-Hispanic	79.1%	77.7%	79.1%	80.5%	81.6%	82.3%	82.4%	71.8%	71.0%	71.7%	72.7%	73.9%	74.6%	75.2%
Other, non-Hispanic	1.2%	1.2%	1.2%	1.3%	1.4%	1.4%	1.5%	3.0%	2.9%	3.0%	3.1%	3.2%	3.3%	3.5%
Multiracial, non-Hispanic	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Rural	5.1%	5.2%	5.1%	5.1%	5.2%	5.2%	5.1%	9.6%	9.6%	9.6%	9.5%	9.4%	9.3%	9.3%
Dual eligible	30.3%	32.0%	30.4%	28.4%	27.0%	25.8%	24.8%	34.5%	35.1%	34.7%	33.7%	32.9%	32.7%	32.3%
Persons aged ≥25 years with less than HS diploma in the beneficiary's county	12.8%	13.0%	12.8%	12.6%	12.5%	12.4%	12.4%	15.0%	15.1%	15.0%	14.9%	14.8%	14.7%	14.6%
Reason for Medicare Entitlement														
Original End-Stage Renal Disease	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.6%	1.6%	1.6%	1.6%	1.6%	1.5%	1.5%

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Original Disabled	25.3%	25.4%	25.4%	25.2%	25.1%	24.8%	24.3%	28.8%	28.7%	29.0%	28.7%	28.5%	28.1%	27.8%
Current End-Stage Renal Disease	0.8%	0.8%	0.8%	0.7%	0.5%	0.4%	0.4%	1.1%	1.1%	1.1%	0.9%	0.6%	0.6%	0.6%
Current Disabled	12.1%	12.4%	12.1%	11.6%	11.3%	10.8%	10.2%	14.4%	14.6%	14.5%	14.1%	13.6%	13.1%	12.6%
Chronic Conditions														
Chronic kidney disease	46.4%	44.0%	45.9%	49.5%	55.0%	57.4%	58.2%	46.0%	43.8%	45.1%	49.1%	55.0%	57.3%	58.3%
Congestive heart failure	42.7%	42.8%	42.5%	42.8%	42.8%	43.2%	43.4%	46.5%	46.9%	46.3%	46.3%	46.2%	46.1%	46.1%
Diabetes	46.3%	46.5%	46.4%	45.9%	45.8%	45.6%	45.5%	49.0%	49.2%	49.1%	48.9%	48.8%	48.9%	48.9%
Pressure ulcers and chronic ulcers	24.6%	24.2%	24.7%	25.0%	25.2%	25.5%	25.8%	23.6%	23.4%	23.6%	23.7%	23.8%	23.9%	24.4%
Alzheimer's disease and related disorders or senile dementia	36.7%	36.0%	36.5%	37.6%	39.6%	40.5%	40.9%	33.4%	33.0%	33.2%	34.1%	36.4%	37.5%	37.6%
Ischemic heart disease	57.5%	58.3%	57.4%	56.7%	56.5%	56.4%	56.4%	58.2%	58.9%	58.2%	57.6%	57.1%	56.7%	56.4%
Anemia	61.7%	62.5%	61.7%	60.9%	60.5%	60.3%	60.6%	58.7%	59.3%	58.5%	58.2%	57.9%	58.2%	58.6%
Alternative Payment Models (APMs)														
BPCI2	0.9%	0.0%	0.3%	2.5%	3.9%	2.9%	1.9%	0.9%	0.0%	0.5%	2.1%	3.0%	2.4%	1.8%
BPCI3	0.1%	0.0%	0.1%	0.3%	0.5%	0.5%	0.3%	0.2%	0.0%	0.2%	0.3%	0.5%	0.4%	0.3%
BPCI Advanced**	N/A	N/A	N/A	N/A	N/A	N/A	0.6%	N/A	N/A	N/A	N/A	N/A	N/A	0.7%
ACO SSP	18.2%	13.0%	18.7%	23.1%	21.7%	27.9%	32.8%	14.7%	9.3%	14.6%	20.2%	23.0%	26.4%	29.8%
ACO Next Generation**	N/A	N/A	N/A	N/A	3.3%	6.5%	8.9%	N/A	N/A	N/A	N/A	1.4%	3.6%	4.1%
ACO Pioneer**	4.5%	4.1%	4.3%	5.1%	3.7%	N/A	N/A	2.0%	2.6%	1.7%	1.6%	0.5%	N/A	N/A

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
HCC score (1st episode)	2.67	2.61	2.66	2.73	2.81	2.90	2.97	2.60	2.57	2.60	2.64	2.72	2.81	2.89
ESRD Flag#	2.9%	2.8%	2.9%	3.0%	3.1%	3.2%	3.2%	3.7%	3.6%	3.7%	3.7%	3.8%	3.8%	3.9%
% Change in home health beneficiaries from previous year	N/A	N/A	-1.9%	0.7%	-0.8%	-1.6%	-0.5%	N/A	N/A	-0.5%	1.1%	0.4%	-2.0%	-2.0%

These numbers reflect the percentages of all Medicare FFS home health episodes in the CY, regardless if their HHA received a TPS score in 2018.

**Number of home health beneficiaries with Medicare FFS home health claims for 2013-2015 represent unique number of beneficiaries in that 3 year period.*

*** Values listed as "N/A" reflect years where the APM is not active.*

#This is defined as either having an unfailed kidney transplant at the start of home health episode or having a dialysis claim during the 365 days before the home health episode begins.

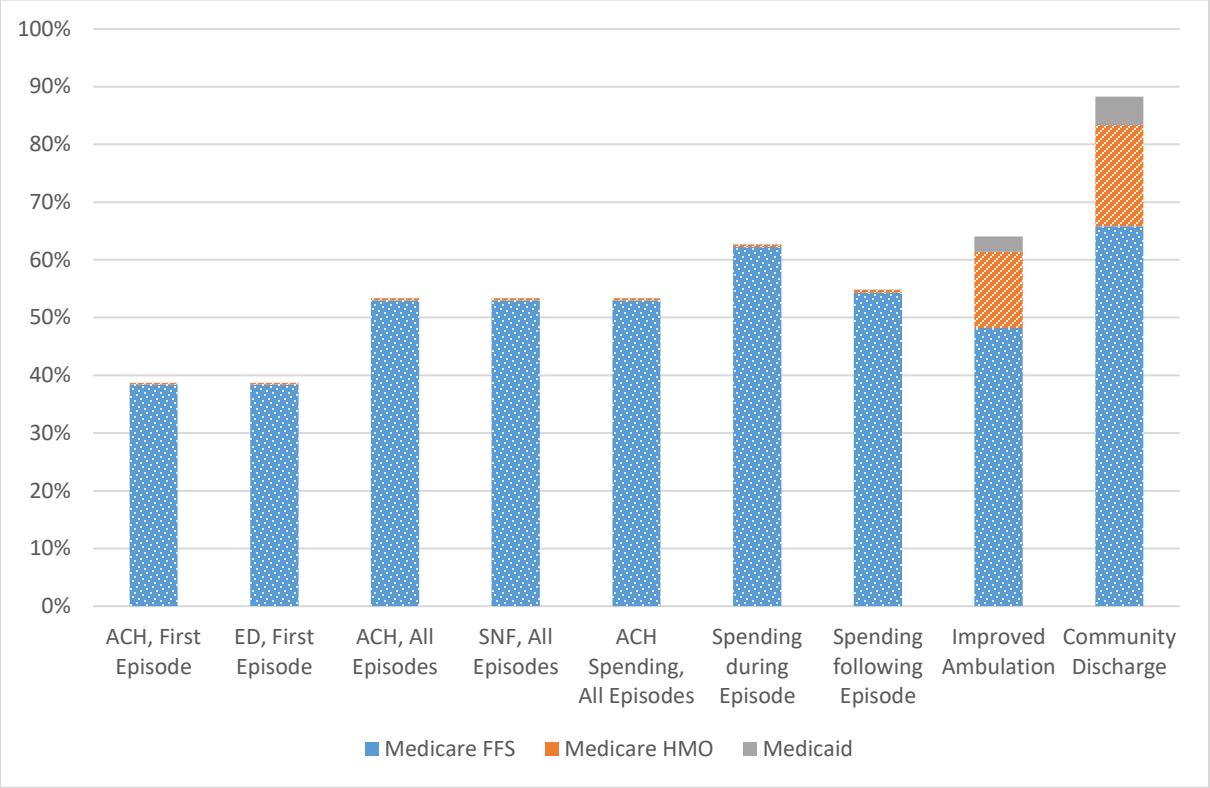
Exhibit C-5. FFS Episode Characteristics in 2013 – 2018, by Year, All HHVBP States, and All Non-HHVBP States

	HHVBP							Non-HHVBP						
	2013-2015	2013	2014	2015	2016	2017	2018	2013-2015	2013	2014	2015	2016	2017	2018
Total number of FFS episodes	4,422,930	1,501,589	1,460,096	1,461,245	1,430,348	1,402,802	1,399,939	15,417,548	5,173,186	5,113,875	5,130,487	5,080,946	4,916,118	4,776,305
Episodes Type*														
Normal	84.3%	83.9%	84.5%	84.4%	83.9%	83.9%	84.2%	86.6%	86.3%	86.9%	86.6%	86.0%	85.3%	85.6%
LUPA	9.1%	9.2%	9.1%	9.1%	9.1%	8.9%	8.6%	8.7%	8.8%	8.7%	8.7%	8.6%	8.6%	8.5%
High cost outlier	4.1%	4.4%	3.9%	4.1%	4.5%	4.5%	4.5%	2.7%	2.9%	2.5%	2.7%	3.3%	4.0%	3.9%
PEP	3.6%	3.7%	3.6%	3.6%	3.7%	3.9%	3.9%	2.9%	3.0%	2.8%	2.9%	3.0%	3.2%	3.1%
Episodes within a Sequence														
1st in sequence	59.2%	59.3%	59.4%	58.9%	59.5%	59.8%	59.3%	49.2%	48.6%	49.2%	49.9%	50.9%	52.0%	52.5%
2nd in sequence	15.5%	15.3%	15.6%	15.7%	16.0%	16.4%	16.5%	15.2%	15.0%	15.2%	15.4%	15.6%	16.0%	16.2%
3rd+ in sequence	25.3%	25.5%	25.0%	25.3%	24.5%	23.8%	24.2%	35.6%	36.3%	35.6%	34.7%	33.5%	32.0%	31.2%
Average number of visits in an episode	18.0	18.1	18.0	17.9	17.8	17.5	17.6	16.3	16.4	16.3	16.2	16.3	16.3	16.4
Average # of Visits by Type														
Therapy (OT, PT, speech)	7.7	7.5	7.7	7.9	8.1	8.4	8.6	5.8	5.5	5.7	6.1	6.5	6.8	7.2
Skilled nurse	8.6	8.8	8.6	8.4	8.1	7.9	7.8	8.3	8.5	8.3	8.2	8.1	7.9	7.8
Home health aide	1.6	1.7	1.6	1.5	1.3	1.2	1.1	2.1	2.3	2.1	1.9	1.7	1.5	1.4
Medical social services	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

These numbers reflect all FFS home health episodes in the CY, regardless if their HHA received a TPS score in 2018.

**PEP (Partial Episode Payment) is not mutually exclusive with LUPA (Low-Utilization Payment Adjustment) and Outlier, so percentages may sum to > 100%. A PEP occurs when a beneficiary changes HHAs or is discharged and readmitted within a 60-day episode and results in an adjusted, partial payment to the HHA to reflect the time the beneficiary received care.*

Exhibit C-6. Percentage of all OASIS Episodes from HHVBP States in the Denominators of Selected Impact Measures, 2016



Note: Each bar graph represents the percentage of OASIS episodes in HHVBP states in 2016 accounted for by episodes included in the denominator of each measure

C.2 Annual Means for TPS, Spending Measures, and Quality Measures

Exhibit C-7. Unadjusted Annual Means (and Standard Errors) for Impact Measures 2013-2018, HHVBP States

Measure	2013	2014	2015	2016	2017	2018
TPS †	30.9 (0.3561)	28.1 (0.3452)	30.9 (0.3621)	37.1 (0.4141)	42.6 (0.4102)	45.43 (0.4289)
FFS Claims-Based Quality Measures						
*ED Use (no Hospitalization)/First FFS HH Episodes**	11.3% (0.0004)	11.7% (0.0004)	12.2% (0.0004)	12.6% (0.0004)	12.9% (0.0004)	12.8% (0.0004)
*Unplanned Acute Care Hospitalization/First FFS HH Episodes**	15.3% (0.0004)	15.6% (0.0004)	16.1% (0.0004)	16.3% (0.0004)	15.9% (0.0004)	15.5% (0.0004)
Unplanned Acute Care Hospitalization/All FFS HH Episodes	16.8% (0.0003)	17.2% (0.0003)	17.0% (0.0003)	16.8% (0.0003)	17.2% (0.0003)	16.9% (0.0003)
Unplanned Hospital Readmission in the First 30 Days of HH Care	13.1% (0.0007)	12.9% (0.0007)	13.2% (0.0007)	13.0% (0.0007)	12.3% (0.0007)	12.3% (0.0007)
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	9.3% (0.0006)	9.8% (0.0007)	9.9% (0.0006)	10.1% (0.0006)	10.2% (0.0006)	10.2% (0.0007)
SNF Use/All FFS HH Episodes	4.7% (0.0002)	5.0% (0.0002)	5.0% (0.0002)	5.0% (0.0002)	5.1% (0.0002)	4.9% (0.0002)
FFS Claims-Based Spending Measures						
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes*	$32.97 (0.0961)	$34.15 (0.0981)	$33.62 (0.0961)	$32.40 (0.0930)	$33.96 (0.0964)	$34.81 (0.0992)
Average Medicare Spending per Day during and following FFS HH Episodes of Care*	$135.41 (0.1471)	$138.65 (0.1521)	$140.99 (0.1546)	$143.18 (0.1594)	$146.65 (0.1644)	$150.21 (0.1688)
Average Medicare Spending per Day during FFS HH Episodes of Care*	$148.29 (0.1546)	$150.69 (0.1596)	$152.82 (0.1621)	$155.47 (0.1675)	$159.20 (0.1735)	$163.12 (0.1785)
Average Medicare Spending per Day following FFS HH Episodes of Care*	$102.09 (0.2393)	$106.81 (0.2497)	$109.28 (0.2542)	$110.69 (0.2578)	$113.48 (0.2654)	$116.02 (0.2702)
OASIS-Based Outcome Quality Measures						
*Discharged to Community**	73.0% (0.0004)	72.8% (0.0004)	72.4% (0.0004)	72.9% (0.0004)	72.8% (0.0004)	73.2% (0.0003)
*Improvement in Ambulation-Locomotion**	62.5% (0.0005)	64.8% (0.0005)	68.3% (0.0004)	74.0% (0.0004)	77.7% (0.0004)	80.2% (0.0004)
Improvement in Bathing	69.3% (0.0004)	70.0% (0.0004)	72.2% (0.0004)	76.5% (0.0004)	79.6% (0.0004)	81.8% (0.0003)
Improvement in Bed Transferring	58.3% (0.0005)	60.2% (0.0005)	64.7% (0.0005)	71.8% (0.0004)	77.7% (0.0004)	81.3% (0.0004)
Improvement in Dyspnea	64.5% (0.0005)	65.2% (0.0005)	70.1% (0.0005)	74.9% (0.0005)	79.5% (0.0004)	81.9% (0.0004)
Improvement in Management of Oral Medications	48.8% (0.0006)	50.5% (0.0006)	55.0% (0.0005)	61.6% (0.0005)	67.5% (0.0005)	71.3% (0.0004)
Improvement in Pain Interfering with Activity	70.3% (0.0005)	69.9% (0.0005)	71.9% (0.0005)	76.7% (0.0004)	80.3% (0.0004)	82.6% (0.0004)
Improvement in Status of Surgical Wounds	90.2% (0.0007)	90.2% (0.0008)	90.5% (0.0008)	91.4% (0.0007)	92.2% (0.0007)	92.6% (0.0007)

Measure	2013	2014	2015	2016	2017	2018
OASIS-Based Process Quality Measures						
Influenza Immunization Received for Current Flu Season	63.3% (0.3269)	65.2% (0.3240)	56.5% (0.3491)	64.9% (0.3385)	67.6% (0.3309)	68.8% (0.3266)
Pneumococcal Polysaccharide Vaccine Ever Received	65.7% (0.2989)	68.1% (0.2930)	64.5% (0.3186)	72.9% (0.2861)	74.2% (0.2762)	74.7% (0.2712)
Depression Assessment Conducted	95.5% (0.1475)	95.8% (0.1430)	96.0% (0.1365)	96.1% (0.1339)	95.9% (0.1334)	95.5% (0.1473)
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	91.6% (0.1748)	92.4% (0.1669)	93.5% (0.1625)	94.7% (0.1535)	95.6% (0.1449)	95.9% (0.1437)
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	97.8% (0.0759)	98.3% (0.0665)	98.8% (0.0640)	99.0% (0.0634)	99.0% (0.0610)	98.9% (0.0736)
Timely Initiation of Care	92.6% (0.1106)	92.6% (0.1112)	92.6% (0.1170)	93.4% (0.1184)	93.9% (0.1210)	94.6% (0.1193)
HHCAHPS-Based Patient Experience Measures						
How often the home health team gave care in a professional way	89.0% (0.1245)	88.7% (0.1412)	88.7% (0.1416)	88.5% (0.1298)	88.4% (0.1377)	88.4% (0.1383)
How well did the home health team communicate with patients	86.2% (0.1467)	85.9% (0.1664)	85.7% (0.1583)	85.5% (0.1530)	85.5% (0.1541)	85.4% (0.1639)
Did the home health team discuss medicines, pain, and home safety with patients	82.9% (0.1828)	82.8% (0.1835)	82.8% (0.1839)	82.3% (0.1902)	82.6% (0.1849)	82.2% (0.1998)
How do patients rate the overall care from the home health agency	84.6% (0.1993)	84.3% (0.2245)	84.3% (0.2187)	84.3% (0.2086)	84.1% (0.2062)	84.3% (0.2014)
Would patients recommend the home health agency to friends and family	79.8% (0.2382)	79.8% (0.2735)	79.4% (0.2639)	79.2% (0.2578)	78.9% (0.2497)	78.8% (0.2687)

* Key Impact Measure | † We calculated a TPS score for each agency that was eligible to receive one, based on having at least five HHVBP measures with sufficient data and a Medicare participation date prior to the CY used as a baseline period for measuring improvement | *HHVBP Measures indicated by italic text*.

Exhibit C-8. Unadjusted Annual Means (and Standard Errors) for Impact Measures 2013-2018, Non-HHVBP States

Measure	2013	2014	2015	2016	2017	2018
TPS[†]	30.4 (0.1762)	28.4 (0.1763)	30.6 (0.1834)	34.9 (0.1996)	40.0 (0.2007)	42.93 (0.2108)
FFS Claims-Based Quality Measures						
*ED Use (no Hospitalization)/First FFS HH Episodes**	11.9% (0.0002)	12.4% (0.0002)	12.6% (0.0002)	12.7% (0.0002)	13.0% (0.0002)	12.8% (0.0002)
*Unplanned Acute Care Hospitalization/First FFS HH Episodes**	16.2% (0.0003)	16.2% (0.0003)	16.3% (0.0003)	16.5% (0.0003)	15.8% (0.0003)	15.4% (0.0003)
Unplanned Acute Care Hospitalization/All FFS HH Episodes	15.9% (0.0002)	15.9% (0.0002)	15.7% (0.0002)	15.6% (0.0002)	15.9% (0.0002)	15.8% (0.0002)
Unplanned Hospital Readmission in the First 30 Days of HH Care	13.2% (0.0004)	12.9% (0.0004)	13.0% (0.0004)	13.2% (0.0004)	12.2% (0.0004)	12.2% (0.0004)
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	9.7% (0.0004)	10.1% (0.0004)	10.3% (0.0004)	10.4% (0.0004)	10.6% (0.0004)	10.5% (0.0004)
SNF Use/All FFS HH Episodes	3.9% (0.0001)	4.0% (0.0001)	4.1% (0.0001)	4.2% (0.0001)	4.2% (0.0001)	4.2% (0.0001)
FFS Claims-Based Spending Measures						
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes*	$32.07 (0.0519)	$32.58 (0.0522)	$31.79 (0.0510)	$31.10 (0.0496)	$32.48 (0.0516)	$33.56 (0.0540)
Average Medicare Spending per Day during and following FFS HH Episodes of Care*	$128.79 (0.0816)	$131.80 (0.0834)	$134.25 (0.0844)	$137.36 (0.0867)	$141.83 (0.0904)	$146.02 (0.0939)
Average Medicare Spending per Day during FFS HH Episodes of Care*	$132.48 (0.0832)	$135.30 (0.0850)	$138.25 (0.0861)	$142.16 (0.0889)	$147.41 (0.0931)	$152.52 (0.0970)
Average Medicare Spending per Day following FFS HH Episodes of Care*	$113.70 (0.1570)	$117.48 (0.1610)	$118.54 (0.1612)	$119.50 (0.1608)	$122.10 (0.1651)	$123.79 (0.1682)
OASIS-Based Outcome Quality Measures						
*Discharged to Community**	69.8% (0.0002)	70.1% (0.0002)	70.5% (0.0002)	71.0% (0.0002)	71.3% (0.0002)	71.8% (0.0002)
*Improvement in Ambulation-Locomotion**	60.2% (0.0003)	62.2% (0.0003)	65.7% (0.0003)	70.3% (0.0002)	74.0% (0.0002)	76.9% (0.0002)
Improvement in Bathing	66.4% (0.0003)	67.4% (0.0003)	70.0% (0.0002)	73.6% (0.0002)	76.6% (0.0002)	79.1% (0.0002)
Improvement in Bed Transferring	55.9% (0.0003)	57.7% (0.0003)	61.4% (0.0003)	67.0% (0.0003)	72.4% (0.0002)	76.5% (0.0002)
Improvement in Dyspnea	64.4% (0.0003)	65.1% (0.0003)	68.7% (0.0003)	72.2% (0.0003)	76.2% (0.0002)	79.0% (0.0002)
Improvement in Management of Oral Medications	51.6% (0.0003)	53.2% (0.0003)	56.5% (0.0003)	60.8% (0.0003)	65.3% (0.0003)	69.0% (0.0002)
Improvement in Pain Interfering with Activity	66.6% (0.0003)	67.0% (0.0003)	69.5% (0.0003)	73.6% (0.0002)	77.1% (0.0002)	79.9% (0.0002)
Improvement in Status of Surgical Wounds	89.0% (0.0004)	89.0% (0.0004)	89.5% (0.0004)	90.3% (0.0004)	90.7% (0.0004)	91.2% (0.0004)
OASIS-Based Process Quality Measures						
Influenza Immunization Received for Current Flu Season	68.2% (0.1458)	68.8% (0.1458)	57.5% (0.1628)	64.1% (0.1644)	66.8% (0.1636)	68.3% (0.1617)
Pneumococcal Polysaccharide Vaccine Ever Received	68.8% (0.1408)	69.9% (0.1406)	65.9% (0.1510)	72.6% (0.1440)	74.3% (0.1416)	75.3% (0.1409)
Depression Assessment Conducted	94.9% (0.0759)	95.2% (0.0727)	95.6% (0.0702)	95.7% (0.0717)	95.3% (0.0746)	95.3% (0.0765)

Measure	2013	2014	2015	2016	2017	2018
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	93.6% (0.0750)	93.9% (0.0736)	94.8% (0.0707)	95.6% (0.0685)	96.0% (0.0688)	96.3% (0.0675)
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	98.0% (0.0387)	98.4% (0.0346)	98.7% (0.0335)	98.9% (0.0328)	99.0% (0.0318)	99.0% (0.0340)
Timely Initiation of Care	89.5% (0.0695)	89.7% (0.0687)	90.3% (0.0680)	91.0% (0.0698)	91.5% (0.0696)	92.3% (0.0707)
HHCAHPS-Based Patient Experience Measures						
How often the home health team gave care in a professional way	88.2% (0.0709)	88.2% (0.0702)	88.2% (0.0749	88.0% (0.0763)	87.9% (0.0798)	88.0% (0.0755)
How well did the home health team communicate with patients	85.4% (0.0761)	85.3% (0.0788)	85.2% (0.0832)	85.2% (0.0857)	85.1% (0.0876)	85.2% (0.0860)
Did the home health team discuss medicines, pain, and home safety with patients	83.8% (0.0881)	83.9% (0.0875)	83.6% (0.0914)	83.6% (0.0932)	83.3% (0.0975)	83.4% (0.0965)
How do patients rate the overall care from the home health agency	83.6% (0.1110)	83.7% (0.1127)	83.7% (0.1200)	83.7% (0.1215)	83.5% (0.1248)	83.4% (0.1246)
Would patients recommend the home health agency to friends and family	78.5% (0.1364)	78.5% (0.1378)	78.3% (0.1428)	78.1% (0.1427)	77.6% (0.1479)	77.4% (0.1483)

** Key Impact Measure | † We calculated a TPS score for each agency that was eligible to receive one, based on having at least five HHVBP measures with sufficient data and a Medicare participation date prior to the CY used as a baseline period for measuring improvement. HHVBP Measures indicated by italic text.*

C.3 TPS Supporting Analyses

Exhibit C-9. Correlation of Average Measure Scores with Average Differences in Measure Rates, 2016 and 2017

Correlation of Average Measure Score with:	Average Change in Measure Rate, for Performance Period Minus Agency Baseline Period*		Average Difference in Measure Rate, for Performance Period Minus Achievement Threshold*	
	2016	2017	2016	2017
ED Use (no Hospitalization)/First FFS HH Episodes	-0.673	-0.656	-0.702	-0.674
Unplanned Acute Care Hospitalization/First FFS HH Episodes	-0.876	-0.816	-0.838	-0.827
Drug Education on Medications Provided to Patient/Caregiver during Episodes of Care†	0.584	0.346	0.775	0.817
Influenza Immunization Received for Current Flu Season	0.621	0.640	0.641	0.746
Pneumococcal Polysaccharide Vaccine Ever Received	0.561	0.635	0.633	0.687
Discharged to Community	0.763	0.786	0.600	0.619
Improvement in Ambulation-Locomotion	0.676	0.585	0.456	0.409
Improvement in Bathing	0.741	0.754	0.727	0.732
Improvement in Bed Transferring	0.664	0.621	0.555	0.573
Improvement in Management of Oral Medications	0.739	0.609	0.551	0.455
Improvement in Dyspnea	0.740	0.705	0.611	0.652
Improvement in Pain Interfering with Activity	0.857	0.855	0.789	0.813
How often the home health team gave care in a professional way	0.904	0.749	0.753	0.659
How well did the home health team communicate with patients	0.748	0.792	0.705	0.721
Did the home health team discuss medicines, pain, and home safety with patients	0.793	0.698	0.766	0.685
How do patients rate the overall care from the home health agency	0.842	0.789	0.673	0.692
Would patients recommend the home health agency to friends and family	0.954	0.763	0.880	0.632

**p<0.01 for all correlations. | †This measure was dropped for performance year 2018 and all subsequent years of the HHVBP Model[55] and dropped from the CMS Star Ratings in April 2019.[56]*

[55] See 2017 Final Rule here.
[56] See "Modifications to the Quality of Patient Care Star Rating Algorithm for Home Health Agencies." Accessible here.

Exhibit C-10. Average Measure Achievement Thresholds and Benchmarks Measure, Performance Year 2016

HHVBP Performance Measure	Average Achievement Threshold		Average Benchmark	
	HHVBP	Non-HHVBP	HHVBP	Non-HHVBP
ED Use (no Hospitalization)/First FFS HH Episodes	11.9%	12.3%	6.2%	6.0%
Unplanned Acute Care Hospitalization/First FFS HH Episodes	15.9%	15.6%	9.1%	8.8%
Discharged to Community	71.1%	69.5%	83.5%	85.1%
Improvement in Ambulation-Locomotion	66.1%	63.0%	85.0%	84.5%
Improvement in Bathing	70.9%	67.3%	88.1%	88.5%
Improvement in Bed	62.0%	57.7%	81.6%	82.3%
Improvement in Management of Oral Medications	54.0%	52.1%	74.4%	76.0%
Improvement in Dyspnea	69.7%	64.4%	88.0%	87.3%
Improvement in Pain Interfering with Activity	71.4%	66.9%	90.5%	90.9%
Drug Education on Medications Provided to Patient/Caregiver during Episodes of Care†	97.2%	97.4%	99.9%	99.9%
Influenza Immunization Received for Current Flu Season	67.9%	68.5%	91.0%	90.2%
Pneumococcal Polysaccharide Vaccine Ever Received	71.4%	73.3%	93.6%	94.5%
How often the home health team gave care in a professional way	89.1%	89.0%	94.2%	94.0%
How well did the home health team communicate with patients	86.4%	85.9%	91.9%	92.3%
Did the home health team discuss medicines, pain, and home safety with patients	83.8%	84.0%	90.3%	91.6%
How do patients rate the overall care from the home health agency	84.8%	84.9%	93.1%	93.2%
Would patients recommend the home health agency to friends and family	80.2%	79.8%	90.5%	90.5%

†This measure was dropped for performance year 2018 and all subsequent years of the HHVBP Model[55] and dropped from the CMS Star Ratings in April 2019.[56]

Exhibit C-11. HHA Eligibility for Calculating a TPS Score in 2016

	Agencies in HHVBP States			Agencies in Non-Model States		
	Eligible for TPS		Total	Eligible for TPS		Total
	Yes	No		Yes	No	
Total number of HHAs	1,646	473	2,119	7,023	2,534	9,557
% of HHAs	77.7%	22.3%	100.0%	73.5%	26.5%	100.0%
Number of OASIS episodes	1,533,851	32,355	1,566,206	5,152,499	98,861	5,251,360
% of OASIS episodes	97.9%	2.1%	100.0%	98.1%	1.9%	100.0%
Number of Medicare claims episodes	1,398,949	31,399	1,430,348	4,924,334	156,612	5,080,946
% of Medicare claims episodes	97.8%	2.2%	100.0%	96.9%	3.1%	100.0%

Exhibit C-12. HHA Eligibility for Calculating a TPS Score in 2017

	Agencies in HHVBP States			Agencies in Non-Model States		
	Eligible for TPS		Total	Eligible for TPS		Total
	Yes	No		Yes	No	
Total number of HHAs	1,631	404	2,035	6,919	2,260	9,179
% of HHAs	80.1%	19.9%	100.0%	75.4%	24.6%	100.0%
Number of OASIS episodes	1,582,396	22,873	1,605,269	5,368,617	97,609	5,466,226
% of OASIS episodes	98.6%	1.4%	100.0%	98.2%	1.8%	100.0%
Number of Medicare claims episodes	1,383,319	19,483	1,402,802	4,785,007	131,111	4,916,118
% of Medicare claims episodes	98.6%	1.4%	100.0%	97.3%	2.7%	100.0%

Exhibit C-13. Characteristics of HHAs by Eligibility for Calculating a TPS Score in 2018

HHA Characteristics	Agencies in HHVBP States			Agencies in Non-Model States		
	Eligible for TPS		Total	Eligible for TPS		Total
	Yes	No		Yes	No	
Total number of HHAs	1,622	360	1,982	6,779	2,155	8,934
HHA Size: Number of OASIS Episodes (%)						
1-59	6.4%	85.8%	20.1%	7.6%	86.2%	26.0%
60-249	25.6%	11.5%	23.2%	36.2%	10.8%	30.2%
250-499	19.6%	2.4%	16.6%	19.8%	2.0%	15.7%
500-999	17.8%	0.0%	14.7%	16.3%	0.6%	12.6%
≥1,000	30.5%	0.3%	25.3%	20.1%	0.4%	15.5%
Ownership (%)						
For-profit	76.9%	89.2%	79.2%	79.4%	90.3%	82.0%
Non-profit	17.4%	6.4%	15.4%	16.9%	7.4%	14.6%
Government-owned	5.7%	4.4%	5.4%	3.7%	2.3%	3.4%
Setting (%)						
Hospital-based	9.1%	1.9%	7.8%	8.9%	2.3%	7.3%

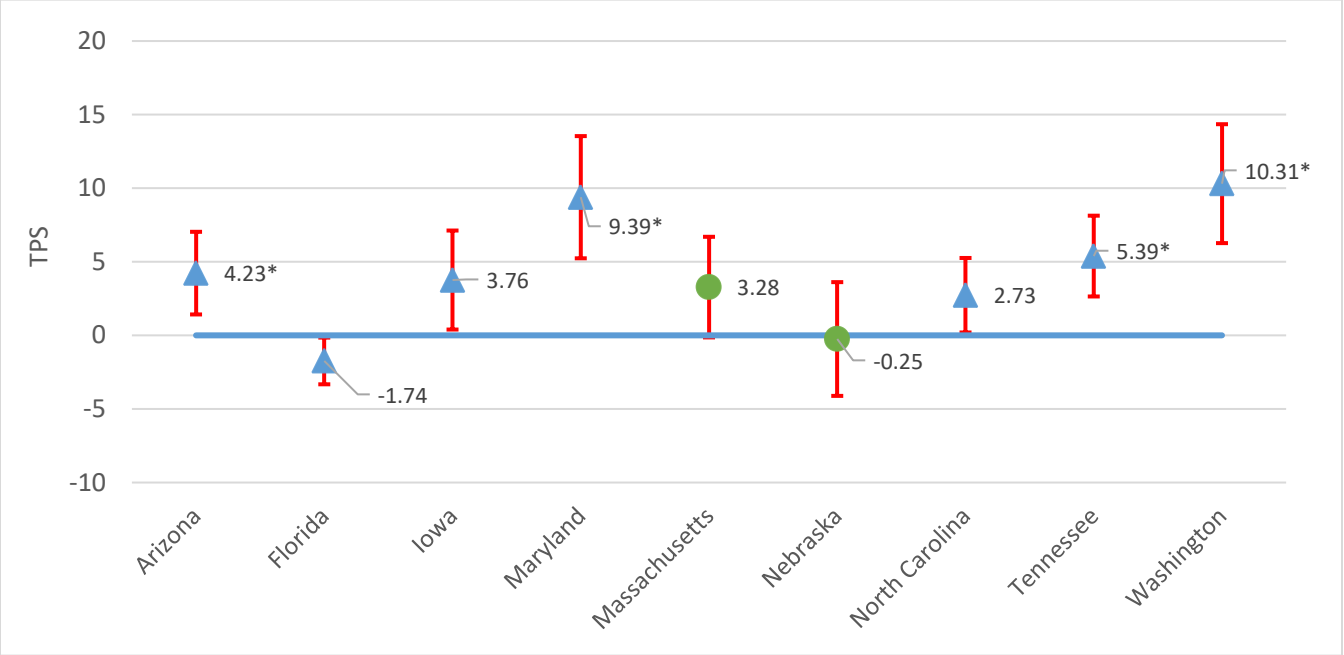
HHA Characteristics	Agencies in HHVBP States			Agencies in Non-Model States		
	Eligible for TPS		Total	Eligible for TPS		Total
	Yes	No		Yes	No	
Freestanding	90.9%	98.1%	92.2%	91.1%	97.7%	92.7%
Chain affiliation (%)						
Chain=Yes	39.8%	7.2%	33.9%	26.1%	7.6%	21.7%
Chain=No	60.0%	83.6%	64.3%	73.5%	86.1%	76.5%
Chain=Missing	0.1%	9.2%	1.8%	0.4%	6.4%	1.8%
HHA years in operation (%)						
<4 years	5.2%	30.8%	9.9%	4.4%	22.5%	8.8%
4-10 years	31.3%	30.0%	31.0%	30.4%	38.1%	32.3%
>10 years	63.5%	39.2%	59.1%	65.2%	39.4%	58.9%

Exhibit C-14. Average Measure Scores among Agencies in HHVBP and Non-HHVBP States, 2016 – 2018

HHVBP Performance Measure	2016		2017		2018	
	HHVBP	Non-HHVBP	HHVBP	Non-HHVBP	HHVBP	Non-HHVBP
ED Use (no Hospitalization)/First FFS HH Episodes	2.3	2.5	2.2	2.3	2.2	2.4
Unplanned Acute Care Hospitalization/First FFS HH Episodes	2.2	2.2	2.7	2.8	2.9	2.9
Discharged to Community	2.9	2.6	2.8	2.5	3.1	2.7
Improvement in Ambulation-Locomotion	4.5	3.9	5.7	5.0	6.5	5.9
Improvement in Bathing	4.2	3.6	5.3	4.4	6.0	5.1
Improvement in Bed	4.5	3.9	6.5	5.4	7.5	6.5
Improvement in Management of Oral Medications	4.2	3.6	5.8	4.9	6.7	5.9
Improvement in Dyspnea	4.0	3.6	5.3	4.6	6.0	5.3
Improvement in Pain Interfering with Activity	4.2	3.7	5.2	4.5	5.7	5.1
Drug Education on Medications Provided to Patient/Caregiver during Episodes of Care[†]	5.7	5.2	6.1	5.7	N/A	N/A
Influenza Immunization Received for Current Flu Season	4.6	4.4	4.8	4.9	5.0	5.1
Pneumococcal Polysaccharide Vaccine Ever Received	4.6	4.6	4.7	4.9	4.8	5.1
How often the home health team gave care in a professional way	2.5	2.7	2.5	2.7	2.7	2.8
How well did the home health team communicate with patients	2.8	2.9	2.8	2.8	3.0	3.0
Did the home health team discuss medicines, pain, and home safety with patients	2.6	2.8	2.8	2.9	2.8	2.9
How do patients rate the overall care from the home health agency	2.8	2.9	2.7	2.8	2.8	2.8
Would patients recommend the home health agency to friends and family	2.6	2.7	2.5	2.6	2.6	2.6
TPS	**37.1**	**34.9**	**42.6**	**40.0**	**45.4**	**42.9**

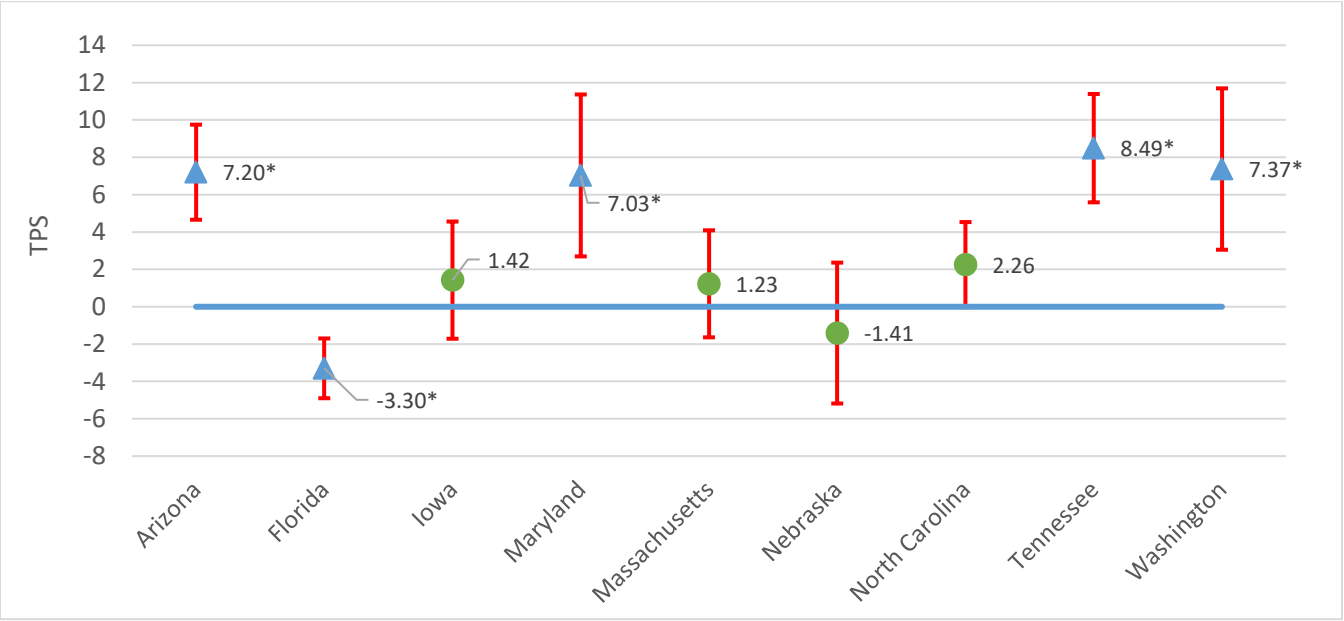
[†]This measure was dropped for performance year 2018 and all subsequent years of the HHVBP Model[55] and dropped from the CMS Star Ratings in April 2019.[56]

Exhibit C-15. Difference in Agency TPS Scores between HHVBP States and their Regional Comparison Groups, 2016



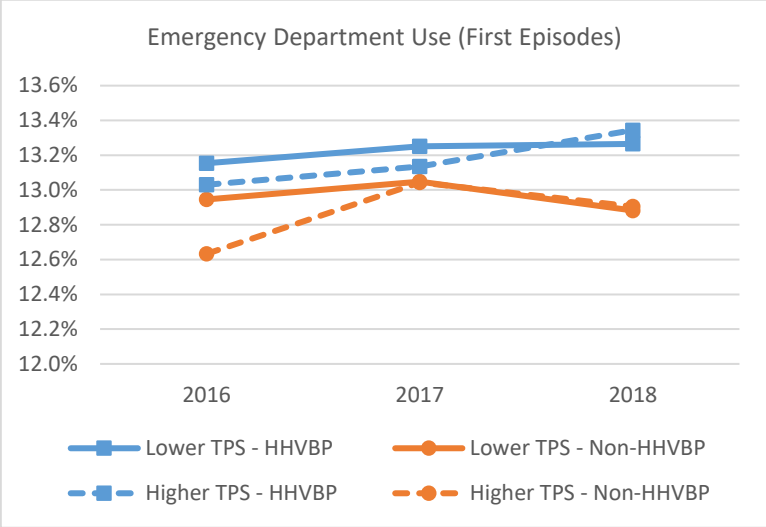
*Blue triangle signifies statistical significance of p < 0.1; *p < 0.05*

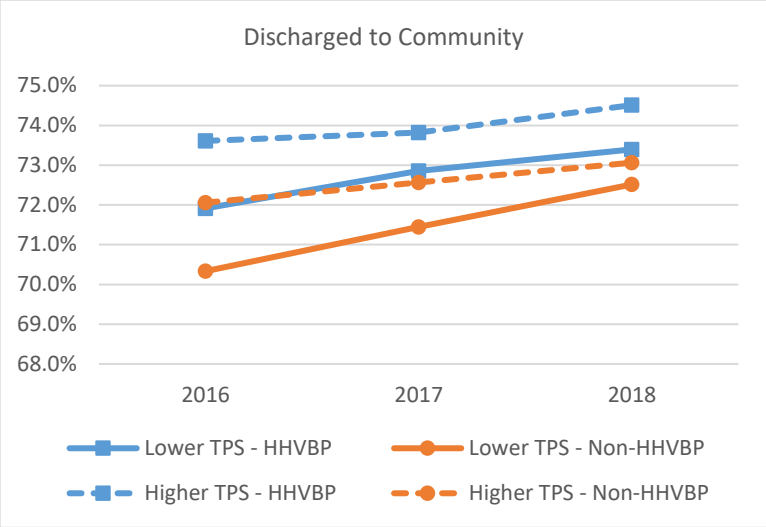
Exhibit C-16. Difference in Agency TPS Scores between HHVBP States and their Regional Comparison Groups, 2017

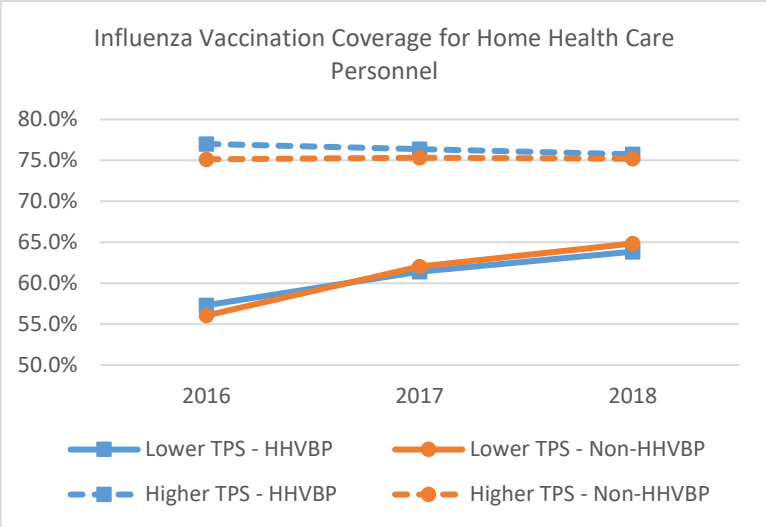


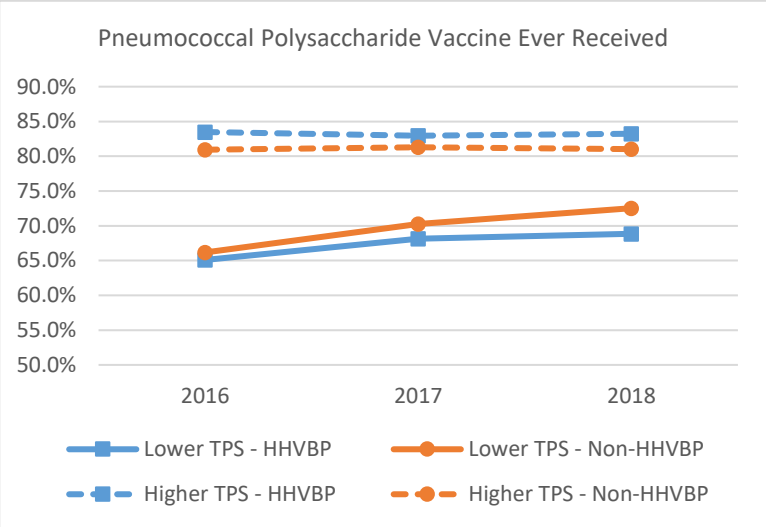
*Blue triangle signifies statistical significance of p < 0.1; *p < 0.05*

Exhibit C-17. Assessing Payment Adjustment Impact on Key Impact Measures Based on Adjusted Models









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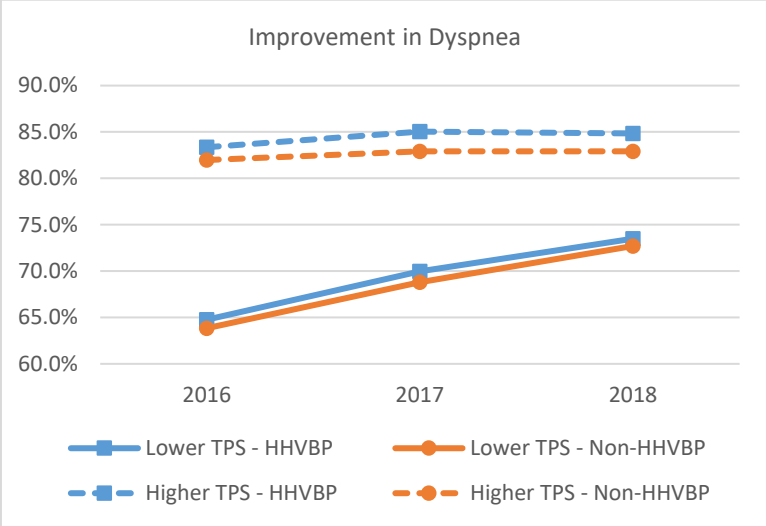
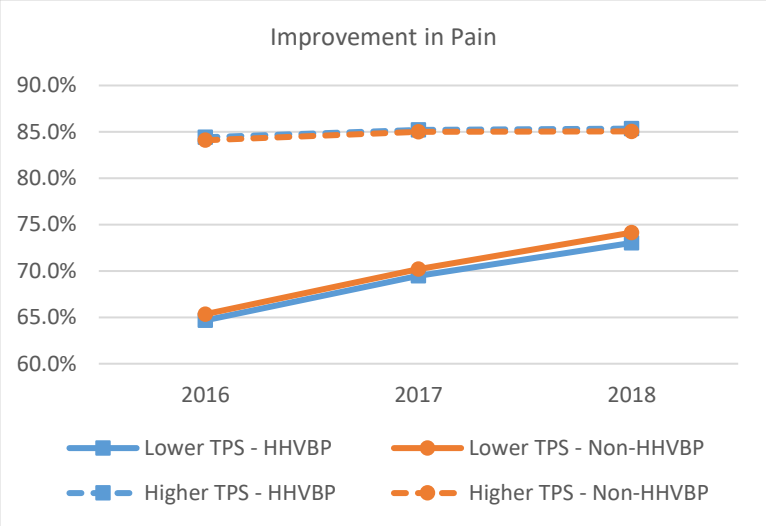
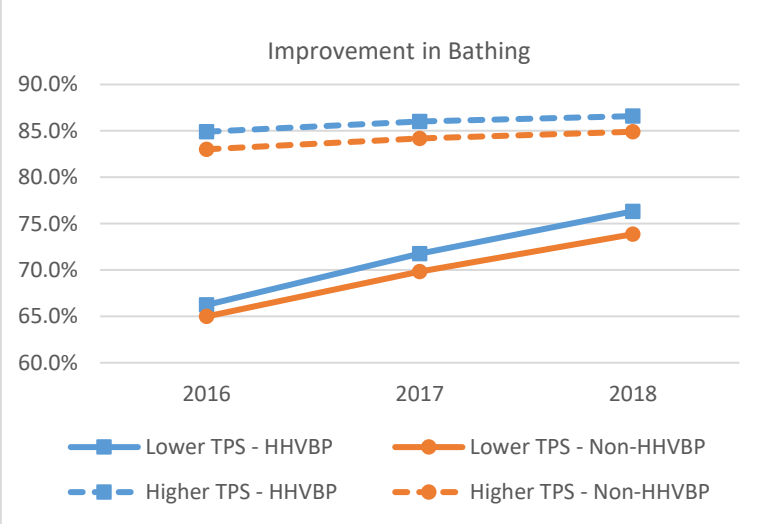
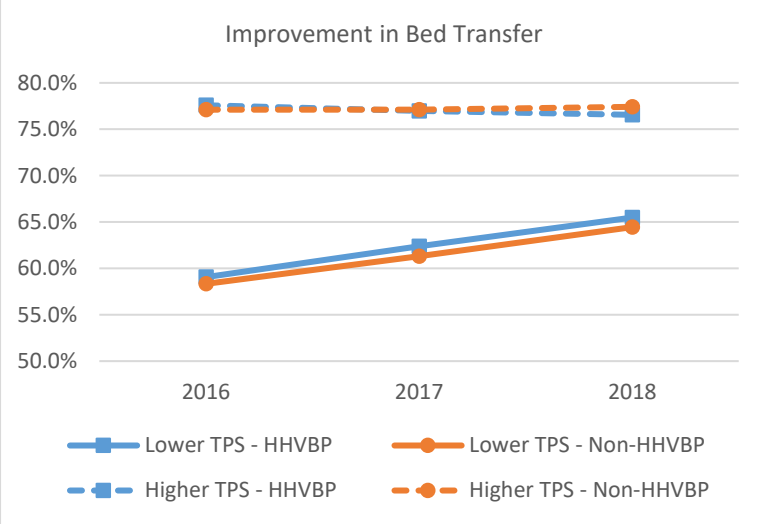
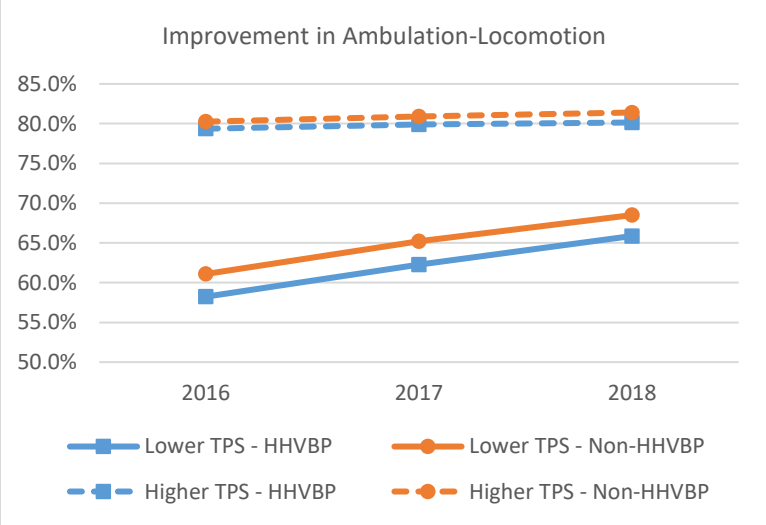

Improvement in Dyspnea
90.0%
85.0%
80.0%
75.0%
70.0%
65.0%
60.0%
2016
2017
2018
Lower TPS - HHVBP
Lower TPS - Non-HHVBP
Higher TPS - HHVBP
Higher TPS - Non-HHVBP


Improvement in Pain
90.0%
85.0%
80.0%
75.0%
70.0%
65.0%
60.0%
2016
2017
2018
Lower TPS - HHVBP
Lower TPS - Non-HHVBP
Higher TPS - HHVBP
Higher TPS - Non-HHVBP


Improvement in Bathing
90.0%
85.0%
80.0%
75.0%
70.0%
65.0%
60.0%
2016
2017
2018
Lower TPS - HHVBP
Lower TPS - Non-HHVBP
Higher TPS - HHVBP
Higher TPS - Non-HHVBP


Improvement in Bed Transfer
80.0%
75.0%
70.0%
65.0%
60.0%
55.0%
50.0%
2016
2017
2018
Lower TPS - HHVBP
Lower TPS - Non-HHVBP
Higher TPS - HHVBP
Higher TPS - Non-HHVBP


Improvement in Ambulation-Locomotion
85.0%
80.0%
75.0%
70.0%
65.0%
60.0%
55.0%
50.0%
2016
2017
2018
Lower TPS - HHVBP
Lower TPS - Non-HHVBP
Higher TPS - HHVBP
Higher TPS - Non-HHVBP

C.4 Payment Adjustment Supporting Analyses

Exhibit C-18. Distribution of CY 2018 HHA Payment Adjustments across HHA Characteristics

	N	Minimum	25th percentile	Mean	Median	75th percentile	Maximum
All	1,622	-2.58	-0.77	0.00	-0.08	0.65	3.00
Type							
Freestanding	1,459	-2.58	-0.77	0.00	-0.09	0.66	3.00
Hospital-based	163	-1.86	-0.80	-0.06	-0.03	0.48	2.44
Ownership							
For profit	1,210	-2.58	-0.78	0.00	-0.10	0.65	3.00
Nonprofit	301	-2.23	-0.66	0.07	0.04	0.77	3.00
Government owned	111	-1.87	-0.84	-0.19	-0.29	0.21	2.44
Chain Affiliation							
Yes	623	-2.10	-0.59	0.02	-0.02	0.60	3.00
No	975	-2.58	-0.88	-0.02	-0.15	0.73	3.00
Unknown	24	-1.38	-0.97	0.15	-0.09	1.14	2.90
Size: Number of OASIS Episodes							
1-59	94	-2.58	-0.96	0.06	-0.08	1.15	3.00
60-249	458	-2.55	-0.88	0.12	-0.05	0.94	3.00
250-499	319	-2.25	-0.82	0.02	0.01	0.80	3.00
500-999	303	-2.30	-0.68	-0.06	-0.10	0.56	2.72
1000+	448	-2.07	-0.68	-0.12	-0.13	0.46	2.22
HHA Age							
<4 years	139	-2.55	-1.26	-0.17	-0.37	0.76	3.00
4-10 years	541	-2.30	-0.71	0.16	0.06	0.87	3.00
>10 years	942	-2.58	-0.75	-0.07	-0.11	0.53	3.00

HHA characteristics from CY 2016. HHA size determined by number of OASIS episodes in CY 2016.

Exhibit C-19. Distribution of CY 2019 HHA Payment Adjustments across HHA Characteristics

	N	Minimum	25th percentile	Mean	Median	75th percentile	Maximum
All	1,616	-5.00	-1.18	-0.11	-0.09	0.93	4.96
Type							
Freestanding	1,466	-5.00	-1.20	-0.10	-0.09	0.95	4.96
Hospital-based	150	-3.93	-1.05	-0.16	-0.12	0.60	4.41
Ownership							
For profit	1,228	-5.00	-1.23	-0.12	-0.11	0.98	4.96
Nonprofit	287	-2.87	-0.88	0.02	0.01	0.79	4.41
Government owned	101	-3.93	-1.41	-0.32	-0.26	0.62	3.77
Chain Affiliation							
Yes	629	-3.79	-0.72	0.07	0.10	0.89	3.53
No	973	-5.00	-1.42	-0.22	-0.33	0.96	4.96
Unknown	14	-2.64	-1.79	-0.39	-0.53	0.50	2.93
Size: Number of OASIS Episodes							
1-59	97	-4.95	-1.78	-0.18	-0.29	1.30	4.92
60-249	427	-4.73	-1.51	-0.08	-0.24	1.29	4.96
250-499	313	-5.00	-1.18	-0.08	-0.13	1.18	4.62
500-999	310	-3.79	-0.96	-0.06	0.01	0.96	3.81
1000+	469	-3.82	-0.90	-0.17	-0.11	0.64	2.44
HHA Age							
<4 years	121	-4.38	-2.18	-0.59	-0.72	0.90	3.57
4-10 years	521	-5.00	-1.22	0.03	0.02	1.28	4.96
>10 years	974	-4.95	-1.06	-0.12	-0.09	0.79	4.56

HHA characteristics from CY 2017. HHA size determined by number of OASIS episodes in CY 2017.

C.5 Sample Size Tables

The tables in this section provide the sample size for their corresponding table in the Third Annual Report. For example, Exhibit 33n corresponds to Exhibit 33 in the Third Annual Report.

Exhibit 13n. Sample Size for Cumulative D-in-D Results for Home Health Utilization among FFS Beneficiaries

Measure	HHVBP	Non-HHVBP
Percent of FFS Beneficiaries with at Least One HH Episode	3,276	15,548
Number of HH Episodes per 1,000 FFS Beneficiaries	3,276	15,548

These numbers represent the number of counties-years.

Exhibit 14n. Sample Size for Baseline and Performance Period Means for Measures of Case-Mix Severity, All HHVBP and Non-HHVBP States

Measure	HHVBP States, Baseline (2013-2015)	Non-HHVBP States, Baseline (2013-2015)	HHVBP States, Post-HHVBP (2016-2018)	Non-HHVBP States, Post-HHVBP (2016-2018)
HCC Score at the Start of Care	6,642	28,319	5,785	26,075
OASIS ADL Composite Index	6,769	28,986	6,049	27,378
Percent of Episodes with Poor Overall Health Status	6,767	28,973	6,048	27,368

These numbers represent the number of home health agencies.

Exhibit 15n. Sample Size for Cumulative D-in-D Results for Case Mix of Home Health Patients

Measure	HHVBP	Non-HHVBP
HCC Score at the Start of Care	8,647,158	30,166,155
OASIS ADL Composite Index	9,348,149	30,964,289
Percent of Episodes with Poor Overall Health Status	9,335,157	30,906,123

Exhibit 30n. Sample Size for Baseline and Performance Period Means for FFS Claims-Based Health Care Utilization Measures, All HHVBP States and Non-HHVBP States

FFS Claims-Based Health Care Utilization Measures	All HHVBP States 2013-2015	All Non-HHVBP States 2013-2015	All HHVBP States 2016-2018	All Non-HHVBP States 2016-2018
*ED Use (no Hospitalization)/First FFS HH Episodes**	2,185,882	6,155,132	2,068,752	6,110,046
*Unplanned Acute Care Hospitalization/First FFS HH Episodes**	2,185,882	6,155,132	2,068,752	6,110,046
Unplanned Acute Care Hospitalization/All FFS HH Episodes	3,738,657	12,863,583	3,579,134	12,279,426
Unplanned Hospital Readmission in the First 30 Days of HH Care	632,997	1,891,967	638,875	1,906,022
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	632,997	1,891,967	638,875	1,906,022
SNF Use/All FFS HH Episodes	3,738,657	12,863,583	3,579,134	12,279,426

** Key Impact Measure | HHVBP Measures indicated by italic text.*

Exhibit 31n. Sample Size for Cumulative D-in-D Results for FFS Claims-Based Utilization Measures

FFS Claims-Based Health Care Utilization Measures	HHVBP	Non-HHVBP
ED Use (no Hospitalization)/First FFS HH Episodes	4,035,352	11,528,584
Unplanned Acute Care Hospitalization/First FFS HH Episodes	4,035,352	11,528,584
Unplanned Acute Care Hospitalization/All FFS HH Episodes	6,997,115	23,870,402
Unplanned Hospital Readmission in the First 30 Days of HH Care	1,185,232	3,501,847
ED Use following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	1,185,232	3,501,847
SNF Use/All FFS HH Episodes	6,997,115	23,870,402

HHVBP Measures indicated by italic text. | Sample size reflects episodes from 2013-2018 with non-missing data.

Exhibit 42n. Sample Size for Baseline and Performance Period Means for FFS Claims-Based Spending Measures, All HHVBP States and Non-HHVBP States

FFS Claims-Based Spending Measures	All HHVBP States 2013-2015	All Non-HHVBP States 2013-2015	All HHVBP States 2016-2018	All Non-HHVBP States 2016-2018
Average Medicare Spending per Day during and following FFS HH Episodes of Care*	4,397,045	15,025,265	4,201,522	14,366,428
Average Medicare Spending per Day during FFS HH Episodes of Care*	4,397,045	15,025,265	4,201,522	14,366,428
Average Medicare Spending per Day following FFS HH Episodes of Care*	2,982,701	8,481,216	2,872,708	8,518,063
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes*	3,738,657	12,863,583	3,579,134	12,279,426

** Key Impact Measure.*

Exhibit 45n. Sample Size for Cumulative D-in-D Results for FFS Claims-Based Spending Measures

FFS Claims-Based Spending Measures	HHVBP	Non-HHVBP
Average Medicare Spending per Day during and following FFS HH Episodes of Care*	8,202,583	27,829,243
Average Medicare Spending per Day during FFS HH Episodes of Care*	8,202,583	27,829,243
Average Medicare Spending per Day following FFS HH Episodes of Care*	5,556,146	15,983,008
Average Medicare Spending per Day for Unplanned Acute Care Hospitalizations among all FFS HH Episodes*	6,997,115	23,870,402

** Key Impact Measure | Sample size reflects episodes from 2013-2018 with non-missing data.*

Exhibit 48n. Sample Size for Baseline and Performance Period Means for OASIS-Based Impact Measures, All HHVBP States and Non-HHVBP States

OASIS-Based Impact Measures	All HHVBP States 2013-2015	All Non-HHVBP States 2013-2015	All HHVBP States 2016-2018	All Non-HHVBP States 2016-2018
OASIS-Based Outcome Quality Measures				
*Discharged to Community**	4,433,420	14,432,464	4,767,780	16,075,112
*Improvement in Ambulation-Locomotion**	3,148,954	9,843,843	3,474,552	11,435,357
Improvement in Bathing	3,212,916	10,058,525	3,508,842	11,559,665
Improvement in Bed Transferring	2,982,937	9,269,002	3,411,457	11,181,345
Improvement in Dyspnea	2,345,331	7,229,746	2,808,345	8,878,394
Improvement in Management of Oral Medications	2,427,695	7,643,242	3,112,240	10,000,465
Improvement in Pain Interfering with Activity	2,639,937	8,393,428	3,019,863	10,030,936
Improvement in Status of Surgical Wounds	461,012	1,604,136	432,223	1,544,007
OASIS-Based Process Quality Measures				
Influenza Immunization Received for Current Flu Season	24,101	105,501	21,855	99,257
Pneumococcal Polysaccharide Vaccine Ever Received	25,283	109,385	22,758	102,702
Depression Assessment Conducted	25,259	109,448	22,760	102,777
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	24,486	105,685	22,064	98,886
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	25,016	108,420	22,550	101,438
Timely Initiation of Care	25,317	109,634	22,851	103,061

** Key Impact Measure | HHVBP Measures indicated by italic text.*

Exhibit 54n. Sample Size for Cumulative D-in-D Results for OASIS Outcome Impact Measures

OASIS-Based Outcome Impact Measures	HHVBP	Non-HHVBP
Discharged to Community	9,188,495	30,437,377
Improvement in Ambulation-Locomotion	6,615,368	21,231,306
Improvement in Bathing	6,713,141	21,569,297
Improvement in Bed Transferring	6,386,817	20,405,138
Improvement in Dyspnea	5,147,366	16,078,820
Improvement in Management of Oral Medications	5,533,246	17,605,778
Improvement in Pain Interfering with Activity	5,652,663	18,383,968
Improvement in Status of Surgical Wounds	891,951	3,141,383

HHVBP Measures indicated by italic text. | Sample size reflects episodes from 2013-2018 with non-missing data.

Exhibit 57n. Sample Size for Cumulative D-in-D Results for OASIS Process Impact Measures

OASIS-Based Process Impact Measures	HHVBP	Non-HHVBP
Influenza Immunization Received for Current Flu Season	45,938	204,674
Pneumococcal Polysaccharide Vaccine Ever Received	48,017	211,981
Depression Assessment Conducted	47,998	212,115
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	46,537	204,510
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	47,546	209,772
Timely Initiation of Care	48,144	212,576

HHVBP Measures indicated by italic text. | Sample size reflects episodes from 2013-2018 with non-missing data.

Exhibit 58n. Sample Size for Baseline and Performance Period Means for HHCAHPS-Based Patient Experience Impact Measures, All HHVBP States and Non-HHVBP States

HHCAHPS-Based Patient Experience Impact Measures	All HHVBP States 2013-2015	All Non-HHVBP States 2013-2015	All HHVBP States 2016-2018	All Non-HHVBP States 2016-2018
All 5 HHCAHPS-Based Patient Experience Impact Measures	4,494	18,977	4,564	18,786

HHVBP Measures indicated by italic text. | Sample size reflects episodes from 2013-2018 with non-missing data.

Exhibit 59n. Sample Size for Cumulative D-in-D Results for HHCAHPS-Based Impact Measures

HHCAHPS-Based Patient Experience Impact Measures	HHVBP	Non-HHVBP
All 5 HHCAHPS-Based Patient Experience Impact Measures	9,058	37,757

HHVBP Measures indicated by italic text. | Sample size reflects episodes from 2013-2018 with non-missing data.

C.6 Spending Components

Exhibit C-20. Baseline and Performance Period Means for Medicare Spending Components, All HHVBP States and Non-HHVBP States

Average Medicare spending per day by type of service	HHVBP States 2013-2015		Non-HHVBP States 2013-2015		HHVBP States 2016-2018		Non-HHVBP States 2016-2018	
	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent
Average Medicare Spending per Day during and following FFS Home Health Episodes of Care								
Total	$138.33	100.0%	$131.61	100.0%	$146.66	100.0%	$141.65	100.0%
Home health	$44.87	31.8%	$41.07	30.5%	$45.21	30.2%	$42.88	29.6%
Inpatient	$45.60	32.8%	$46.70	35.2%	$49.28	33.5%	$49.88	35.0%
Outpatient institutional	$10.95	8.2%	$11.62	9.0%	$13.14	9.2%	$13.78	10.0%
Outpatient emergency department	$2.20	1.6%	$2.08	1.6%	$2.79	1.9%	$2.56	1.8%
Other outpatient	$8.74	6.6%	$9.53	7.5%	$10.35	7.4%	$11.23	8.2%
Skilled nursing facility	$11.36	8.1%	$9.93	7.4%	$11.69	7.8%	$10.72	7.5%
Hospice	$2.81	2.0%	$2.19	1.6%	$3.38	2.3%	$2.78	1.9%
Part B non-institutional*	$23.32	17.1%	$21.20	16.2%	$24.49	16.9%	$22.43	16.0%
Average Medicare Spending per Day during FFS Home Health Episodes of Care								
Total	$150.59	100.0%	$135.33	100.0%	$159.24	100.0%	$147.25	100.0%
Home health	$63.56	41.3%	$54.29	39.1%	$63.99	39.3%	$57.53	38.2%
Inpatient	$45.83	30.3%	$44.18	32.5%	$49.87	31.2%	$48.10	32.6%
Outpatient institutional	$11.23	7.8%	$11.79	8.9%	$13.58	8.8%	$14.08	9.8%
Outpatient emergency department	$2.37	1.6%	$2.19	1.6%	$3.01	1.8%	$2.71	1.8%
Other outpatient	$8.85	6.2%	$9.59	7.3%	$10.56	7.0%	$11.37	8.0%
Skilled nursing facility	$5.64	3.7%	$4.43	3.2%	$6.08	3.8%	$5.07	3.4%
Hospice	$1.62	1.1%	$1.11	0.8%	$1.86	1.2%	$1.39	0.9%
Part B non-institutional*	$23.53	15.9%	$20.68	15.4%	$24.60	15.7%	$21.97	15.1%
Average Medicare Spending per Day following FFS Home Health Episodes of Care								
Total	$106.01	100.0%	$116.58	100.0%	$113.38	100.0%	$121.78	100.0%
Inpatient	$45.05	41.1%	$54.49	44.8%	$47.87	40.9%	$55.11	43.5%
Outpatient institutional	$10.15	9.7%	$11.09	9.4%	$11.99	10.7%	$12.87	10.6%
Outpatient Emergency department	$1.82	1.7%	$1.78	1.5%	$2.28	1.9%	$2.15	1.7%
Other outpatient	$8.32	8.1%	$9.29	8.0%	$9.70	8.8%	$10.71	8.9%
Skilled nursing facility	$25.25	22.8%	$27.16	22.1%	$25.26	21.4%	$27.34	21.5%
Hospice	$5.72	5.2%	$5.59	4.5%	$7.06	5.9%	$6.91	5.3%
Part B non-institutional*	$22.80	21.1%	$22.95	19.1%	$24.16	21.0%	$23.82	19.1%

**Includes Part B carrier and durable medical equipment claims.*
By definition, there is no home health spending associated with average Medicare spending per day following FFS home health episodes of care measure (see Exhibit A-28).
Average is based on capped expenditure measures. Capping was done separately for total and for each component such that component means do not add up to the total mean. Percent column is based on uncapped expenditure measure values.

Exhibit C-21. Cumulative D-in-D Results of the HHVBP Model on Medicare Spending Components

Medicare spending per day by type of service	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D	p-value	Lower 90% CI	Upper 90% CI		
Average Medicare Spending per Day during and following FFS Home Health Episodes of Care						
Total	-$1.62	<0.01	-$2.63	-$0.62	$138.33	-1.2%
Home Health	$0.01	0.96	-$0.34	$0.36	$44.87	0.02%
Inpatient	-$0.93	0.02	-$1.60	-$0.27	$45.60	-2.0%
Outpatient Institutional	$0.09	0.36	-$0.07	$0.26	$10.95	0.8%
Outpatient Emergency department	$0.13	<0.001	$0.08	$0.17	$2.20	5.8%
Other outpatient	-$0.04	0.67	-$0.19	$0.11	$8.74	-0.4%
Skilled nursing facility	-$0.45	<0.001	-$0.67	-$0.23	$11.36	-4.0%
Hospice	-$0.05	0.35	-$0.13	$0.04	$2.81	-1.7%
Part B non-institutional*	-$0.18	0.17	-$0.40	$0.04	$23.32	-0.8%
Average Medicare Spending per Day during FFS Home Health Episodes of Care						
Total	-$1.40	0.05	-$2.57	-$0.24	$150.59	-0.9%
Home Health	$0.45	0.20	-$0.12	$1.02	$63.56	0.7%
Inpatient	-$1.45	<0.001	-$2.15	-$0.75	$45.83	-3.2%
Outpatient Institutional	$0.10	0.39	-$0.09	$0.29	$11.23	0.9%
Outpatient Emergency department	$0.16	<0.001	$0.11	$0.21	$2.37	6.6%
Other outpatient	-$0.06	0.57	-$0.24	$0.12	$8.85	-0.7%
Skilled nursing facility	-$0.28	<0.01	-$0.43	-$0.12	$5.64	-4.9%
Hospice	$0.01	0.91	-$0.07	$0.08	$1.62	0.3%
Part B non-institutional*	-$0.21	0.15	-$0.45	$0.03	$23.53	-0.9%
Average Medicare Spending per Day following FFS Home Health Episodes of Care						
Total	$0.13	0.89	-$1.43	$1.69	$106.01	0.1%
Inpatient	$0.97	0.16	-$0.16	$2.10	$45.05	2.2%
Outpatient Institutional	$0.09	0.43	-$0.10	$0.28	$10.15	0.9%
Outpatient Emergency department	$0.06	0.07	$0.01	$0.11	$1.82	3.2%
Other outpatient	$0.03	0.74	-$0.14	$0.21	$8.32	0.4%
Skilled nursing facility	-$0.48	0.23	-$1.13	$0.18	$25.25	-1.9%
Hospice	-$0.24	0.04	-$0.44	-$0.04	$5.72	-4.2%
Part B non-institutional*	$0.08	0.60	-$0.18	$0.35	$22.80	0.4%

**Includes Part B carrier and durable medical equipment claims.*
By definition, there is no home health spending associated with average Medicare spending per day following FFS home health episodes of care measure (see Exhibit A-28).
CI= Confidence Interval.|These models include state-specific linear time trends. | Average is based on capped expenditure measures. Capping was done separately for total and for each component such that the component means do not add up to the total mean.

C.7 OASIS Supporting Analyses

The below numbers reflect all OASIS home health episodes in the calendar year that were eligible for the specific OASIS outcome measure (regardless if their HHA received a TPS in 2018).

Exhibit C-22. "Start of Care" Values for Improvement in Ambulation-Locomotion in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	1,034,511	1,043,286	1,066,677	1,114,362	1,148,780	1,207,752
Non-HHVBP	3,146,340	3,253,550	3,427,719	3,623,526	3,811,630	3,968,541
Able to independently walk with the use of a one-handed device						
HHVBP	12.2%	10.1%	8.5%	6.3%	4.7%	3.9%
Non-HHVBP	13.1%	11.3%	9.8%	7.7%	6.1%	5.0%
Requires two handed device or human assistance						
HHVBP	39.7%	35.6%	31.2%	24.1%	18.9%	15.8%
Non-HHVBP	38.8%	36.0%	32.8%	28.0%	23.9%	20.4%
Walks only with supervision or assistance from another at all times						
HHVBP	39.4%	45.4%	50.9%	59.2%	65.3%	68.7%
Non-HHVBP	38.8%	43.1%	47.7%	54.0%	59.3%	63.6%
Chairfast to bedfast						
HHVBP	8.7%	9.0%	9.4%	10.3%	11.2%	11.6%
Non-HHVBP	9.3%	9.6%	9.7%	10.3%	10.7%	11.0%

Exhibit C-23. "Start of Care" Values for Improvement in Bed Transferring in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	965,727	989,768	1,023,321	1,084,575	1,130,437	1,192,989
Non-HHVBP	2,925,158	3,062,218	3,266,491	3,504,988	3,737,171	3,909,112
Able to transfer with minimal human assistance or with use of an assistive device						
HHVBP	72.1%	66.1%	58.8%	47.6%	34.1%	27.1%
Non-HHVBP	71.1%	67.0%	61.0%	52.2%	40.2%	32.8%
Able to bear weight and pivot during the transfer but unable to transfer self						
HHVBP	22.1%	27.6%	34.2%	43.5%	55.3%	61.0%
Non-HHVBP	22.2%	25.8%	31.1%	38.5%	49.3%	55.4%
Unable to transfer self and is unable to bear weight or pivot when transferred by another person						
HHVBP	4.4%	5.0%	5.8%	7.7%	9.5%	10.8%
Non-HHVBP	5.1%	5.6%	6.4%	7.8%	9.2%	10.4%
Bedfast, unable to transfer but is able to turn and position self in bed						
HHVBP	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%
Non-HHVBP	0.6%	0.5%	0.5%	0.5%	0.5%	0.5%
Bedfast, unable to transfer and is unable to turn and position self						
HHVBP	0.9%	0.9%	0.8%	0.8%	0.7%	0.7%

	2013	2014	2015	2016	2017	2018
Non-HHVBP	1.1%	1.0%	1.0%	0.9%	0.9%	0.9%

Exhibit C-24. "Start of Care" Values for Improvement in Bathing in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	1,060,378	1,063,565	1,084,268	1,128,531	1,159,431	1,216,968
Non-HHVBP	3,227,798	3,324,885	3,489,218	3,671,767	3,852,725	4,002,904
With the use of devices in shower/tub						
HHVBP	7.8%	6.6%	6.1%	4.8%	3.7%	3.3%
Non-HHVBP	9.1%	8.0%	7.2%	6.0%	4.9%	4.1%
With intermittent assistance in shower/tub						
HHVBP	24.3%	22.4%	20.4%	17.0%	14.0%	12.2%
Non-HHVBP	23.9%	23.1%	22.0%	19.6%	17.2%	14.9%
Participates with supervision in shower/tub						
HHVBP	41.8%	43.9%	45.5%	47.1%	49.0%	49.9%
Non-HHVBP	39.8%	41.4%	43.3%	45.5%	47.4%	49.2%
Independent at sink, in chair, or on commode						
HHVBP	7.9%	7.7%	7.3%	7.1%	6.8%	6.3%
Non-HHVBP	8.2%	7.9%	7.3%	7.0%	6.7%	6.4%
Participates with assist at sink, in chair, or commode						
HHVBP	12.9%	14.0%	15.1%	17.6%	19.4%	21.2%
Non-HHVBP	13.6%	14.1%	14.5%	16.0%	17.6%	19.1%
Unable to participate; bathed totally by another						
HHVBP	5.2%	5.4%	5.6%	6.4%	7.1%	7.1%
Non-HHVBP	5.4%	5.5%	5.5%	5.9%	6.3%	6.4%

Exhibit C-25. "Start of Care" Values for Improvement in Pain Interfering in Activity in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	865,812	873,708	896,540	959,552	996,905	1,060,146
Non-HHVBP	2,667,254	2,777,185	2,935,077	3,148,695	3,336,156	3,519,601
Pain does not interfere with activity						
HHVBP	10.4%	9.8%	9.8%	8.7%	8.1%	8.0%
Non-HHVBP	10.7%	10.1%	9.6%	8.9%	8.6%	8.3%
Less often than daily						
HHVBP	11.7%	11.5%	11.9%	11.8%	12.3%	11.8%
Non-HHVBP	13.3%	12.9%	12.7%	12.3%	12.5%	12.3%
Daily, but not constant						
HHVBP	59.7%	59.7%	58.4%	57.6%	56.8%	56.4%
Non-HHVBP	58.0%	58.2%	58.3%	57.8%	57.4%	57.3%

	2013	2014	2015	2016	2017	2018
Constant						
HHVBP	18.2%	19.0%	19.9%	21.9%	22.8%	23.7%
Non-HHVBP	18.0%	18.8%	19.4%	20.9%	21.5%	22.1%

Exhibit C-26. "Start of Care" Values for Improvement in Management of Oral Medications in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	771,671	800,335	852,278	953,754	1,035,371	1,119,837
Non-HHVBP	2,384,046	2,513,795	2,732,669	3,018,100	3,352,154	3,605,014
Patient is able to take oral medications if prepared in advance/another person develops a drug diary						
HHVBP	41.7%	39.6%	37.0%	31.6%	24.3%	18.8%
Non-HHVBP	41.6%	39.8%	37.4%	33.8%	28.5%	23.4%
Able to take medications at the correct time if given reminders by another person at the appropriate times						
HHVBP	20.3%	20.2%	19.5%	18.3%	16.6%	14.5%
Non-HHVBP	22.0%	21.9%	21.5%	20.7%	19.5%	18.0%
Unable to take medication unless administered by another person						
HHVBP	38.0%	40.3%	43.5%	50.1%	59.2%	66.6%
Non-HHVBP	36.4%	38.3%	41.1%	45.5%	52.0%	58.6%

Exhibit C-27. "Start of Care" Values for Improvement in Dyspnea in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	766,646	775,279	800,000	869,314	926,243	1,009,884
Non-HHVBP	2,308,755	2,381,254	2,528,139	2,741,665	2,939,939	3,179,068
Patient is short of breath only when walking more than 20 feet						
HHVBP	38.4%	37.7%	37.6%	35.8%	33.1%	30.3%
Non-HHVBP	37.1%	36.8%	36.6%	35.3%	33.5%	31.5%
With moderate exertion						
HHVBP	43.4%	43.9%	43.5%	43.5%	45.3%	47.0%
Non-HHVBP	42.9%	43.1%	42.8%	43.1%	44.5%	46.0%
With minimal exertion or at rest						
HHVBP	18.2%	18.4%	18.9%	20.7%	21.7%	22.7%
Non-HHVBP	20.0%	20.0%	20.6%	21.6%	22.0%	22.5%

Exhibit C-28. "Start of Care" Values for Improvement in Status of Surgical Wounds in 2013-2018, HHVBP States and Non-HHVBP States

	2013	2014	2015	2016	2017	2018
Sample Size						
HHVBP	159,862	152,720	147,641	146,784	143,229	141,715

	2013	2014	2015	2016	2017	2018
Non-HHVBP	542,871	534,257	524,485	522,803	515,478	501,489
Fully granulating						
HHVBP	10.1%	8.7%	7.9%	7.0%	6.7%	6.5%
Non-HHVBP	10.1%	8.8%	8.2%	7.7%	7.4%	7.1%
Early/partial granulation						
HHVBP	25.3%	20.9%	18.1%	15.7%	14.4%	13.7%
Non-HHVBP	24.2%	20.4%	18.4%	16.9%	15.6%	14.8%
Not healing						
HHVBP	64.6%	70.4%	74.0%	77.3%	78.9%	79.8%
Non-HHVBP	65.7%	70.7%	73.4%	75.4%	77.1%	78.1%

C.8 Entry/Exit Supporting Analyses

Exhibit C-29. Number of HHAs Opening and Terminating Quarterly in HHVBP and Non-HHVBP States, 2013-2018

		Opening HHAs (n)		Terminating HHAs (n)		Open HHAs* (n)	
Year	Quarter	HHVBP	Non-HHVBP	HHVBP	Non-HHVBP	HHVBP	Non-HHVBP
2013	Q1	37	141	23	55	2,452	10,013
	Q2	29	147	30	78	2,458	10,105
	Q3	24	111	63	66	2,452	10,138
	Q4	22	91	54	75	2,411	10,163
2014	Q1	22	71	56	79	2,379	10,159
	Q2	20	72	57	105	2,343	10,152
	Q3	24	70	41	108	2,310	10,117
	Q4	19	60	46	81	2,288	10,069
2015	Q1	28	51	27	69	2,270	10,039
	Q2	18	54	34	91	2,261	10,024
	Q3	28	69	23	76	2,255	10,002
	Q4	22	69	20	101	2,254	9,995
2016	Q1	39	52	28	91	2,273	9,946
	Q2	20	50	25	93	2,265	9,905
	Q3	17	82	23	171	2,257	9,894
	Q4	15	44	38	121	2,249	9,767
2017	Q1	6	38	20	116	2,217	9,684
	Q2	12	56	26	93	2,209	9,624
	Q3	7	47	28	100	2,190	9,578
	Q4	10	46	23	118	2,172	9,524
2018	Q1	10	61	19	84	2,159	9,467
	Q2	6	54	17	110	2,146	9,437
	Q3	N/A	N/A	N/A	N/A	N/A	N/A
	Q4	N/A	N/A	N/A	N/A	N/A	N/A

Gray shading indicates data not available due to data lag in the POS file.
**Open HHAs are defined by the POS certification and termination dates and may include inactive HHAs that do not have HH episodes in a given quarter.*

C.9 Supporting Analyses for HHA Interviews

Exhibit C-30. ACH and ED Rates in 2018 by HHVBP HHAs with Low and High Proportions of Rural Beneficiaries

HHVBP HHAs	Average ACH Rate, 2018	Average ED Rate, 2018
High proportion of rural patients (N=136)	15.6%	14.1%*
Low proportion of rural patients (N=1,486)	15.2%	12.2%*

** p-value <0.01 for difference between agencies with high vs. low proportion of rural patients.*
Agencies were defined as having a high proportion of rural patients if their percentage of episodes from rural patients was greater than or equal to the top decile among all agencies.

Exhibit C-31. Severity of Case-Mix According to Agency Setting and Ownership Status

HHVBP HHAs	HCC Score	Poor overall health status
Setting		
Freestanding	2.96*	45.4%*
Hospital-based	3.02*	49.8%*
Ownership status		
For-profit	2.95*	43.2%*
Not-for-profit	3.03*	51.7%*
Government	3.00*	43.0%*

** p-value <0.01 for difference between agency setting or ownership status across two measures of severity of case mix: Hierarchical Condition Category (HCC) score and poor overall health status.*
HCC score was defined as the composite HCC score for the first episode of a sequence. Overall health status was defined as the percentage of patients whose overall status (OASIS Assessment item M1034) was option 2 or 3 (i.e., "more sick" categories).

C.10 HHVBP Self-Reported Measures

Exhibit C-32. Reporting Rates for the Self-Reported HHVBP Measures in 2018, by HHA Characteristic

Agency Characteristics		All 3 Measures Reported (%)	All 3 Measures Reported (N)	Total Number of HHAs
All HHAs with a TPS		**79.6%**	**1,278**	**1,606**
Size Cohorts	Small HHAs	61.3%	98	160
	Large HHAs	81.4%	861	1058
	Single Size (Statewide)	82.2%	319	388
Setting	Freestanding	78.4%	1,145	1,461
	Hospital-Based	91.7%	133	145
HHA Age	<4 Years Old	56.5%	35	62
	4-10 Years Old	72.7%	370	509
	>10 Years Old	84.4%	873	1,035
Ownership Status	For-Profit	77.1%	953	1,236
	Government-Owned	84.4%	76	90
	Non-Profit	88.9%	249	280
Chain Status	Chain - No	74.9%	718	959
	Chain - Yes	86.7%	559	645
	Chain - Information not available	50.0%	1	2
Size (# of OASIS episodes)	1-59	66.3%	67	101
	60-249	71.8%	293	408
	250-499	81.0%	255	315
	500-999	84.3%	242	287
	1000+	85.1%	421	495
2018 TPS Quartile*	First Quartile	67.2%	359	534
	Second Quartile	78.3%	224	286
	Third Quartile	85.2%	270	317
	Fourth Quartile	90.6%	425	469
CY 2020* Payment Adjustment Category	[-6%, -3%)	41.1%	51	124
	[-3%, -1%]	71.5%	236	330
	(-1%, 0%]	81.5%	304	373
	(0%, 1%]	85.5%	307	359
	(1%, 3%]	91.1%	295	324
	(3%, 6%]	88.5%	85	96

*HHA characteristics from CY 2018 | *CY 2020 Payment adjustments (announced to HHVBP HHAs in Fall 2019) were determined by TPS in 2018 .*

C.11 State-Level Analyses

C.11.1 Balance Tables

Exhibit C-33. Number of HHAs 2013-2018, by HHVBP State

State	2013	2014	2015	2016	2017	2018
Arizona (AZ)	154	159	158	156	161	163
Florida (FL)	1,399	1,279	1,163	1,073	984	944
Iowa (IA)	168	164	162	162	159	156
Maryland (MD)	174	187	204	229	238	236
Massachusetts (MA)	55	54	54	52	53	52
North Carolina (NC)	177	177	174	172	171	169
Nebraska (NE)	78	76	76	76	76	75
Tennessee (TN)	146	143	138	137	131	127
Washington (WA)	62	62	63	62	62	60
All HHVBP States	2,413	2,301	2,192	2,119	2,035	1,982
All Non-HHVBP States	9,869	9,871	9,707	9,557	9,179	8,934

Exhibit C-34. Average Number of HH Episodes per 1,000 FFS Beneficiaries, 2013-2018

	AZ	FL	IA	MD	MA	NE	NC	TN	WA
HHVBP States									
2013	97.5	289.6	84.7	124.0	209.3	92.4	133.9	215.0	84.7
2014	97.9	273.2	81.9	123.9	202.6	90.5	133.7	198.8	84.6
2015	103.4	269.5	79.8	129.3	208.4	92.8	137.7	196.6	85.8
2016	105.1	250.7	75.8	131.8	206.6	92.2	139.5	190.7	87.6
2017	102.6	234.8	76.3	135.2	205.3	89.9	141.9	187.2	88.5
2018	105.2	237.4	74.2	136.3	206.9	88.7	141.0	187.3	87.9
Non-HHVBP Regional Comparison Group									
2013	165.1	395.5	86.5	142.3	166.6	140.6	160.1	214.4	84.3
2014	169.6	379.3	89.8	141.2	163.9	141.5	155.2	206.1	85.3
2015	177.5	368.0	95.0	142.3	170.9	141.6	157.8	207.9	87.6
2016	182.1	354.2	95.3	141.8	172.9	141.8	158.7	194.9	90.3
2017	183.1	330.2	95.9	140.3	174.0	139.1	159.5	181.7	90.4
2018	188.3	310.3	98.5	135.9	172.8	136.6	161.2	179.3	89.4

Exhibit C-35. Beneficiary and Agency Characteristics 2013-2015, National, Arizona, Florida, and Iowa and their Corresponding Comparison Group

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
Beneficiary Characteristics (Claims)												
Average age	77.0	75.8	0.10	77.5	76.6	0.08	77.3	74.8	0.21	77.2	77.8	-0.05
Age categories												
Age 0 - 64	13.0%	15.6%	-0.08	9.4%	13.2%	-0.13	12.4%	17.9%	-0.17	12.5%	12.6%	0.00
Age 65 - 84	56.3%	56.9%	-0.01	60.4%	57.4%	0.06	55.7%	57.8%	-0.04	57.2%	53.3%	0.08
Age 85 and Older	30.8%	27.5%	0.07	30.2%	29.4%	0.02	32.0%	24.2%	0.17	30.4%	34.1%	-0.08
Female	62.1%	62.8%	-0.01	59.3%	60.6%	-0.03	61.6%	64.5%	-0.06	62.2%	61.9%	0.01
Race/Ethnicity												
Hispanic (regardless of race)	9.5%	8.5%	0.03	7.3%	15.7%	-0.32	18.8%	16.4%	0.06	0.8%	0.8%	-0.01
Black, non-Hispanic	10.1%	16.5%	-0.21	2.7%	7.3%	-0.29	8.4%	21.7%	-0.48	2.5%	3.6%	-0.07
White, non-Hispanic	79.1%	71.8%	0.18	87.4%	67.3%	0.61	71.8%	59.1%	0.28	96.0%	94.0%	0.11
Other, non-Hispanic	1.2%	3.0%	-0.17	2.5%	9.5%	-0.45	0.9%	2.6%	-0.19	0.6%	1.4%	-0.10
Multiracial, non-Hispanic	0.1%	0.2%	-0.02	0.1%	0.2%	-0.03	0.1%	0.3%	-0.04	0.1%	0.2%	-0.04
Dual Eligible	30.3%	34.5%	-0.09	15.8%	42.1%	-0.72	34.6%	40.9%	-0.13	20.4%	19.5%	0.02
Rural	5.1%	9.6%	-0.20	0.9%	1.6%	-0.08	1.6%	14.8%	-1.06	24.8%	11.5%	0.31
Reason for Medicare Entitlement												
Original ESRD	1.2%	1.6%	-0.04	1.4%	1.5%	-0.01	1.1%	2.1%	-0.09	1.1%	1.0%	0.00
Original Disabled	25.3%	28.8%	-0.08	19.7%	23.4%	-0.09	23.6%	31.5%	-0.19	23.9%	23.5%	0.01
Current ESRD	0.8%	1.1%	-0.03	0.9%	1.0%	-0.01	0.7%	1.5%	-0.08	0.7%	0.6%	0.01
Current Disabled	12.1%	14.4%	-0.07	8.5%	12.1%	-0.13	11.5%	16.2%	-0.14	11.5%	11.7%	-0.01
HHA Characteristics												
Ownership												
For-profit	71.0%	69.5%	0.03	85.6%	80.2%	0.15	89.1%	91.5%	-0.08	22.0%	27.3%	-0.13
Non-profit	25.9%	28.0%	-0.05	14.4%	18.5%	-0.11	10.2%	6.7%	0.12	62.7%	68.9%	-0.13
Government-owned	3.1%	2.5%	0.04	0.0%	1.3%	N/A	0.8%	1.8%	-0.12	15.3%	3.7%	0.32
Setting												
Hospital-based	8.4%	11.1%	-0.10	7.4%	7.5%	0.00	2.7%	3.9%	-0.07	29.1%	24.7%	0.10
Freestanding	91.6%	88.9%	0.10	92.6%	92.5%	0.00	97.3%	96.1%	0.07	70.9%	75.3%	-0.10
Chain affiliation												
Chain = Yes	42.3%	57.8%	-0.31	47.9%	73.2%	-0.51	49.3%	62.1%	-0.26	41.5%	47.9%	-0.13

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
Chain = No	54.6%	40.1%	0.29	49.9%	26.2%	0.47	46.9%	36.8%	0.20	57.0%	49.1%	0.16
Chain = Missing	3.1%	2.1%	0.06	2.2%	0.6%	0.11	3.8%	1.1%	0.14	1.5%	3.1%	-0.13
HHA Age												
HHA age < 4 years	7.3%	6.8%	0.02	15.5%	16.4%	-0.03	12.3%	6.2%	0.18	1.5%	2.9%	-0.12
HHA age 4-10 years	25.4%	24.0%	0.03	34.1%	34.0%	0.00	45.6%	31.5%	0.28	8.2%	11.3%	-0.11
HHA age > 10 years	67.3%	69.1%	-0.04	50.4%	49.6%	0.02	42.1%	62.2%	-0.41	90.4%	85.8%	0.15
Agency Size												
HHAs with 1-59 OASIS Episodes	1.3%	3.4%	-0.19	1.7%	2.7%	-0.08	2.2%	7.7%	-0.38	2.9%	1.9%	0.06
HHAs with 60-249 OASIS Episodes	7.5%	15.6%	-0.31	9.8%	20.0%	-0.34	11.6%	25.3%	-0.43	23.8%	12.0%	0.28
HHAs with 250-499 OASIS Episodes	11.1%	14.7%	-0.11	17.9%	22.5%	-0.12	15.9%	18.0%	-0.06	17.3%	13.7%	0.10
HHAs with 500-999 OASIS Episodes	17.1%	16.8%	0.01	25.8%	20.5%	0.12	20.2%	18.7%	0.04	15.1%	17.0%	-0.05
HHAs with 1000+ OASIS Episodes	63.0%	49.5%	0.28	44.7%	34.3%	0.21	50.2%	30.3%	0.40	41.0%	55.5%	-0.29
APMs												
BPCI2	0.9%	0.9%	0.01	1.2%	0.8%	0.04	0.6%	0.5%	0.02	1.2%	0.3%	0.08
BPCI3	0.1%	0.2%	-0.02	0.2%	0.1%	0.02	0.1%	0.1%	0.02	0.1%	0.1%	-0.02
BPCI Advanced‡	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACO SSP	18.2%	14.7%	0.09	20.8%	11.5%	0.23	17.5%	10.7%	0.18	39.6%	13.3%	0.54
ACO Next Generation‡	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACO Pioneer‡	4.5%	2.0%	0.12	12.1%	6.8%	0.16	0.4%	0.4%	-0.01	2.6%	6.1%	-0.22
HCC Score (1st episode)	2.7	2.6	0.04	2.9	2.6	0.13	2.6	2.4	0.13	2.6	2.4	0.09
ESRD Flag	2.9%	3.7%	-0.05	3.4%	3.9%	-0.02	2.7%	4.1%	-0.08	2.7%	2.6%	0.00
Beneficiary Characteristics (OASIS)												
Inpatient discharge within 14 days	67.8%	71.4%	-0.08	76.1%	67.9%	0.19	57.1%	64.7%	-0.15	77.8%	74.2%	0.09

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
Ambulation and Locomotion												
Requires two handed device for level ground or human assistance for stairs and uneven ground	32.3%	32.8%	-0.01	34.0%	34.4%	-0.01	35.9%	34.4%	0.03	34.0%	31.2%	0.06
Walks only with supervision or assistance from another at all times	42.6%	40.2%	0.05	40.2%	38.3%	0.04	39.5%	37.8%	0.03	42.0%	44.0%	-0.04
Chairfast to bedfast	11.2%	11.9%	-0.02	13.9%	13.3%	0.02	10.2%	13.4%	-0.10	7.1%	11.2%	-0.16
Management of Oral Medications												
Able to take medications at the correct time if given reminders by another person at the appropriate times	15.1%	16.4%	-0.04	14.9%	18.9%	-0.11	15.1%	18.1%	-0.08	15.4%	15.3%	0.00
Unable to take medication unless administered by another person	32.7%	30.6%	0.04	28.0%	30.1%	-0.05	26.7%	25.1%	0.03	36.7%	39.1%	-0.05
Patient is receiving psychiatric nursing services	2.1%	1.4%	0.05	0.8%	0.8%	0.00	2.4%	1.6%	0.05	1.2%	1.1%	0.02
Risk for Hospitalization												
Multiple hospitalizations in past 6 months	36.4%	37.1%	-0.01	37.9%	31.6%	0.13	31.8%	38.7%	-0.15	41.0%	38.4%	0.05
History of falls	32.8%	31.4%	0.03	35.3%	30.5%	0.10	31.7%	34.9%	-0.07	34.9%	35.6%	-0.01
Currently taking 5 or more medications	88.3%	87.0%	0.04	84.9%	85.7%	-0.02	88.4%	88.4%	0.00	88.9%	89.5%	-0.02
Recent decline in mental, emotional, or behavioral status	16.1%	14.9%	0.03	13.9%	15.4%	-0.04	15.4%	16.5%	-0.03	22.3%	17.2%	0.12
Frailty	33.6%	34.0%	-0.01	34.2%	36.4%	-0.05	32.6%	34.1%	-0.03	46.3%	37.7%	0.17
Skin Lesion or Open Wound that is not a Stasis Ulcer or Surgical Wound	23.1%	24.1%	-0.03	19.1%	19.6%	-0.01	19.8%	24.7%	-0.12	25.7%	29.4%	-0.08

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
Short of Breath												
When walking more than 20ft, climbing stairs	25.2%	23.7%	0.04	24.0%	22.5%	0.04	25.9%	17.1%	0.20	23.7%	26.5%	-0.07
With moderate exertion	31.4%	30.7%	0.02	22.9%	31.3%	-0.20	36.1%	37.8%	-0.04	29.2%	25.0%	0.09
With minimal exertion or at rest	15.9%	17.5%	-0.04	11.1%	11.7%	-0.02	15.3%	30.3%	-0.42	24.5%	16.9%	0.18
Surgical Wound	24.4%	25.6%	-0.03	30.7%	25.0%	0.12	21.9%	23.4%	-0.04	26.7%	27.0%	-0.01
Requiring urinary catheter	4.4%	4.6%	-0.01	6.3%	4.9%	0.06	3.9%	4.0%	-0.01	5.0%	5.8%	-0.04
Acute Conditions												
Requires Oxygen therapy	14.3%	16.2%	-0.05	16.4%	15.9%	0.01	11.9%	16.5%	-0.14	18.6%	14.5%	0.10
Orthopedic	43.0%	38.4%	0.09	46.2%	47.2%	-0.02	48.8%	33.3%	0.31	32.8%	37.3%	-0.10
Pressure Ulcer												
Unhealed Pressure Ulcer Stage 2 or Higher	4.8%	5.2%	-0.02	5.6%	5.2%	0.02	3.9%	4.7%	-0.04	4.1%	5.3%	-0.06
Pressure Ulcer Stage 2	3.2%	3.4%	-0.01	3.6%	3.5%	0.01	2.8%	3.0%	-0.01	2.5%	3.3%	-0.05
Pressure Ulcer Stage 3	0.9%	1.0%	-0.01	1.0%	0.9%	0.01	0.6%	1.0%	-0.05	1.0%	1.0%	0.00
Pressure Ulcer Stage 4	0.5%	0.6%	-0.01	0.6%	0.5%	0.01	0.3%	0.7%	-0.05	0.4%	0.6%	-0.02
Pressure Ulcer Not Stageable	0.9%	1.1%	-0.01	1.1%	1.0%	0.01	0.6%	0.9%	-0.04	0.8%	1.1%	-0.04
Diagnosed with Neoplasm	8.1%	8.7%	-0.02	7.5%	8.0%	-0.02	7.7%	7.3%	0.02	9.4%	9.6%	-0.01
Frequency of Pain												
Pain does not interfere with activity	8.1%	8.1%	0.00	10.4%	8.3%	0.07	6.4%	6.1%	0.01	8.1%	9.4%	-0.05
Less often than daily	9.7%	10.7%	-0.04	8.3%	10.2%	-0.07	8.8%	11.7%	-0.10	7.6%	8.4%	-0.03
Daily, but not constant	46.3%	46.7%	-0.01	42.1%	48.5%	-0.13	53.3%	56.5%	-0.06	36.8%	40.2%	-0.07
Constant	15.4%	15.2%	0.01	16.8%	13.6%	0.09	13.0%	14.9%	-0.06	28.6%	21.3%	0.16
Bathing												
With the use of devices in shower/tub	6.1%	7.2%	-0.04	8.6%	8.0%	0.02	6.2%	7.5%	-0.05	7.9%	7.3%	0.02
With intermittent assistance in shower/tub	20.1%	20.8%	-0.02	24.6%	24.0%	0.01	24.1%	24.4%	-0.01	19.2%	15.6%	0.09
Participates with supervision in shower/tub	42.0%	40.0%	0.04	42.8%	41.5%	0.03	45.0%	44.0%	0.02	41.1%	42.9%	-0.04

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
Independent at sink, in chair, or on commode	7.2%	7.2%	0.00	5.7%	4.9%	0.03	6.0%	5.0%	0.04	7.5%	8.0%	-0.02
Participates with assist at sink, in chair, or commode	14.3%	14.1%	0.00	7.8%	9.0%	-0.05	9.7%	9.3%	0.01	15.8%	15.5%	0.01
Unable to participate; bathed totally by another	7.4%	7.6%	-0.01	6.6%	9.0%	-0.10	7.1%	7.9%	-0.03	3.8%	6.1%	-0.12
Bed Transfer												
Able to transfer with minimal human assistance or with use of an assistive device	56.7%	56.7%	0.00	58.4%	58.3%	0.00	59.5%	54.5%	0.10	49.5%	52.7%	-0.06
Able to bear weight and pivot during the transfer but unable to transfer self	25.9%	24.3%	0.04	22.7%	22.1%	0.02	26.2%	27.8%	-0.04	26.0%	25.3%	0.01
Unable to transfer self and is unable to bear weight or pivot when transferred by another person	5.7%	6.4%	-0.03	5.8%	6.3%	-0.02	5.6%	8.5%	-0.13	7.0%	5.2%	0.07
Bedfast, unable to transfer but is able to turn and position self in bed	0.6%	0.7%	-0.01	0.7%	0.9%	-0.02	0.6%	0.9%	-0.03	0.3%	0.4%	-0.02
Bedfast, unable to transfer and is unable to turn and position self	1.5%	1.8%	-0.02	1.6%	2.3%	-0.05	1.4%	2.0%	-0.05	0.6%	1.0%	-0.05
Surgical Wound												
Fully granulating	1.2%	1.3%	-0.01	1.8%	1.8%	0.00	1.2%	1.5%	-0.03	1.4%	1.2%	0.01
Early/ partial granulation	2.8%	3.0%	-0.01	3.7%	4.1%	-0.02	3.1%	3.5%	-0.02	3.7%	2.8%	0.04
Not healing	9.2%	10.1%	-0.03	11.2%	7.8%	0.11	8.3%	7.4%	0.03	12.4%	11.9%	0.02

**Standardized Difference in means. | †Regional grouping does not include the HHVBP state. See Exhibit A-13 above. | ‡2013-2015 values are listed as "N/A" since ACO Next Generation and BPCI Advanced started after 2015. Shading indicates that the absolute standardized differences of means is greater than 0.25.*

Exhibit C-36. Beneficiary and Agency Characteristics 2013-2015, National, Massachusetts, Maryland, and North Carolina and their Corresponding Comparison Group

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
Beneficiary Characteristics (Claims)												
Average age	77.0	75.8	0.10	77.7	77.7	0.00	76.7	77.3	-0.05	74.8	75.7	-0.07
Age categories												
Age 0 - 64	13.0%	15.6%	-0.08	12.2%	12.6%	-0.01	12.3%	12.7%	-0.01	17.4%	14.7%	0.07
Age 65 - 84	56.3%	56.9%	-0.01	53.8%	53.5%	0.01	59.0%	54.6%	0.09	58.1%	59.5%	-0.03
Age 85 and Older	30.8%	27.5%	0.07	33.9%	33.9%	0.00	28.8%	32.7%	-0.09	24.5%	25.8%	-0.03
Female	62.1%	62.8%	-0.01	61.6%	61.5%	0.00	61.9%	61.4%	0.01	62.6%	62.9%	-0.01
Race/Ethnicity												
Hispanic (regardless of race)	9.5%	8.5%	0.03	2.8%	2.7%	0.01	1.2%	4.8%	-0.32	0.7%	0.7%	0.00
Black, non-Hispanic	10.1%	16.5%	-0.21	4.7%	3.7%	0.05	26.0%	11.2%	0.34	20.7%	21.2%	-0.01
White, non-Hispanic	79.1%	71.8%	0.18	91.1%	92.6%	-0.05	70.4%	81.9%	-0.25	77.0%	76.9%	0.00
Other, non-Hispanic	1.2%	3.0%	-0.17	1.3%	0.9%	0.04	2.2%	2.0%	0.01	1.5%	1.1%	0.03
Multiracial, non-Hispanic	0.1%	0.2%	-0.02	0.2%	0.1%	0.00	0.1%	0.1%	0.01	0.2%	0.2%	0.00
Dual Eligible	30.3%	34.5%	-0.09	27.3%	31.9%	-0.10	17.4%	27.3%	-0.26	32.3%	26.0%	0.14
Rural	5.1%	9.6%	-0.20	0.1%	8.2%	-2.33	1.8%	2.2%	-0.02	9.1%	13.7%	-0.16
Reason for Medicare Entitlement												
Original ESRD	1.2%	1.6%	-0.04	0.6%	0.9%	-0.04	1.3%	1.3%	0.00	1.8%	1.8%	0.00
Original Disabled	25.3%	28.8%	-0.08	23.6%	24.7%	-0.03	22.5%	24.4%	-0.04	33.6%	29.8%	0.08
Current ESRD	0.8%	1.1%	-0.03	0.4%	0.5%	-0.03	0.8%	0.8%	-0.01	1.2%	1.2%	0.00
Current Disabled	12.1%	14.4%	-0.07	11.5%	11.8%	-0.01	11.4%	11.8%	-0.01	16.3%	13.6%	0.07
HHA Characteristics												
Ownership												
For-profit	71.0%	69.5%	0.03	29.7%	32.0%	-0.05	58.7%	29.5%	0.59	54.6%	76.5%	-0.44
Non-profit	25.9%	28.0%	-0.05	69.6%	67.4%	0.05	40.7%	68.9%	-0.57	34.1%	18.9%	0.32
Government-owned	3.1%	2.5%	0.04	0.7%	0.6%	0.00	0.6%	1.6%	-0.12	11.4%	4.5%	0.22
Setting												
Hospital-based	8.4%	11.1%	-0.10	10.9%	6.5%	0.14	9.3%	18.5%	-0.32	15.0%	13.4%	0.05
Freestanding	91.6%	88.9%	0.10	89.1%	93.5%	-0.14	90.7%	81.5%	0.32	85.0%	86.6%	-0.05
Chain affiliation												
Chain = Yes	42.3%	57.8%	-0.31	59.8%	68.4%	-0.18	28.7%	59.5%	-0.68	23.2%	24.4%	-0.03
Chain = No	54.6%	40.1%	0.29	32.5%	28.5%	0.09	70.1%	37.1%	0.72	76.8%	73.9%	0.07

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
Chain = Missing	3.1%	2.1%	0.06	7.7%	3.1%	0.17	1.2%	3.4%	-0.20	0.0%	1.7%	-5.01
HHA Age												
HHA age < 4 years	7.3%	6.8%	0.02	4.1%	2.1%	0.10	0.5%	1.9%	-0.20	2.6%	2.6%	0.00
HHA age 4-10 years	25.4%	24.0%	0.03	8.5%	4.8%	0.13	5.5%	6.3%	-0.03	5.2%	12.9%	-0.35
HHA age > 10 years	67.3%	69.1%	-0.04	87.4%	93.1%	-0.17	94.0%	91.7%	0.09	92.3%	84.5%	0.29
Agency Size												
HHAs with 1-59 OASIS Episodes	1.3%	3.4%	-0.19	0.5%	0.2%	0.05	0.1%	0.3%	-0.13	0.0%	0.3%	-0.17
HHAs with 60-249 OASIS Episodes	7.5%	15.6%	-0.31	3.1%	2.8%	0.02	1.2%	2.3%	-0.10	1.8%	3.8%	-0.15
HHAs with 250-499 OASIS Episodes	11.1%	14.7%	-0.11	3.3%	6.0%	-0.15	3.4%	3.6%	-0.01	6.8%	8.7%	-0.08
HHAs with 500-999 OASIS Episodes	17.1%	16.8%	0.01	6.9%	11.2%	-0.17	5.8%	6.5%	-0.03	20.2%	17.3%	0.07
HHAs with 1000+ OASIS Episodes	63.0%	49.5%	0.28	86.1%	79.7%	0.18	89.5%	87.2%	0.07	71.3%	69.9%	0.03
APMs												
BPCI2	0.9%	0.9%	0.01	1.5%	1.9%	-0.04	0.1%	2.2%	-0.69	1.4%	0.8%	0.05
BPCI3	0.1%	0.2%	-0.02	0.1%	0.2%	-0.02	0.3%	0.3%	0.00	0.1%	0.2%	-0.03
BPCI Advanced‡	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACO SSP	18.2%	14.7%	0.09	22.0%	32.2%	-0.25	21.2%	17.5%	0.09	15.3%	14.3%	0.03
ACO Next Generation‡	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACO Pioneer‡	4.5%	2.0%	0.12	29.4%	5.6%	0.52	0.1%	1.3%	-0.53	0.1%	0.0%	0.00
HCC Score (1st episode)	2.7	2.6	0.04	2.7	2.7	0.01	2.9	2.9	-0.02	2.8	2.7	0.06
ESRD Flag	2.9%	3.7%	-0.05	2.3%	2.4%	-0.01	3.8%	3.7%	0.00	3.5%	3.9%	-0.02
Beneficiary Characteristics (OASIS)												
Inpatient discharge within 14 days	67.8%	71.4%	-0.08	76.3%	75.6%	0.02	82.5%	79.0%	0.09	73.5%	73.2%	0.01
Ambulation and Locomotion												
Requires two handed device for level ground or human assistance for stairs and uneven ground	32.3%	32.8%	-0.01	30.2%	33.8%	-0.08	29.9%	31.8%	-0.04	30.1%	29.3%	0.02

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
Walks only with supervision or assistance from another at all times	42.6%	40.2%	0.05	46.0%	41.1%	0.10	44.3%	41.7%	0.05	42.2%	44.1%	-0.04
Chairfast to bedfast	11.2%	11.9%	-0.02	6.8%	7.7%	-0.04	12.8%	9.7%	0.09	13.3%	14.4%	-0.03
Management of Oral Medications												
Able to take medications at the correct time if given reminders by another person at the appropriate times	15.1%	16.4%	-0.04	14.5%	12.4%	0.06	14.5%	14.1%	0.01	13.8%	16.3%	-0.07
Unable to take medication unless administered by another person	32.7%	30.6%	0.04	40.4%	36.5%	0.08	33.9%	33.8%	0.00	33.6%	33.9%	-0.01
Patient is receiving psychiatric nursing services	2.1%	1.4%	0.05	3.9%	3.3%	0.03	1.0%	1.6%	-0.07	1.0%	1.4%	-0.04
Risk for Hospitalization												
Multiple hospitalizations in past 6 months	36.4%	37.1%	-0.01	40.7%	36.4%	0.09	40.3%	35.5%	0.10	37.2%	39.8%	-0.05
History of falls	32.8%	31.4%	0.03	28.3%	29.4%	-0.02	31.1%	25.3%	0.13	32.1%	33.5%	-0.03
Currently taking 5 or more medications	88.3%	87.0%	0.04	89.5%	85.9%	0.12	89.0%	83.3%	0.18	88.6%	89.2%	-0.02
Recent decline in mental, emotional, or behavioral status	16.1%	14.9%	0.03	20.2%	17.2%	0.08	12.4%	12.4%	0.00	11.8%	14.1%	-0.07
Frailty	33.6%	34.0%	-0.01	35.9%	34.8%	0.02	30.6%	31.4%	-0.02	27.3%	31.3%	-0.09
Skin Lesion or Open Wound that is not a Stasis Ulcer or Surgical Wound	23.1%	24.1%	-0.03	30.0%	30.1%	0.00	26.7%	26.4%	0.01	20.7%	21.3%	-0.02
Short of Breath												
When walking more than 20ft, climbing stairs	25.2%	23.7%	0.04	26.3%	27.4%	-0.03	24.1%	27.8%	-0.09	26.2%	22.1%	0.09
With moderate exertion	31.4%	30.7%	0.02	30.1%	24.3%	0.12	23.5%	26.8%	-0.08	27.5%	30.9%	-0.07

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
With minimal exertion or at rest	15.9%	17.5%	-0.04	15.3%	13.5%	0.05	10.9%	11.9%	-0.03	13.4%	18.8%	-0.16
Surgical Wound	24.4%	25.6%	-0.03	24.7%	26.0%	-0.03	29.0%	27.4%	0.04	27.5%	27.0%	0.01
Requiring urinary catheter	4.4%	4.6%	-0.01	3.9%	4.2%	-0.01	4.6%	4.5%	0.00	4.2%	4.6%	-0.02
Acute Conditions												
Requires Oxygen therapy	14.3%	16.2%	-0.05	10.2%	13.1%	-0.09	12.5%	13.8%	-0.04	17.2%	17.0%	0.00
Orthopedic	43.0%	38.4%	0.09	33.0%	33.0%	0.00	47.4%	36.2%	0.22	39.5%	37.5%	0.04
Pressure Ulcer												
Unhealed Pressure Ulcer Stage 2 or Higher	4.8%	5.2%	-0.02	3.9%	4.5%	-0.03	6.4%	5.7%	0.03	5.6%	5.9%	-0.01
Pressure Ulcer Stage 2	3.2%	3.4%	-0.01	2.4%	2.9%	-0.03	3.7%	3.6%	0.01	3.6%	3.9%	-0.02
Pressure Ulcer Stage 3	0.9%	1.0%	-0.01	0.7%	0.8%	0.00	1.5%	1.1%	0.04	1.0%	1.1%	0.00
Pressure Ulcer Stage 4	0.5%	0.6%	-0.01	0.3%	0.4%	-0.01	0.9%	0.6%	0.04	0.7%	0.8%	-0.01
Pressure Ulcer Not Stageable	0.9%	1.1%	-0.01	0.9%	1.0%	-0.01	1.4%	1.3%	0.01	1.1%	1.2%	0.00
Diagnosed with Neoplasm	8.1%	8.7%	-0.02	10.2%	10.5%	-0.01	8.8%	10.9%	-0.07	7.2%	7.6%	-0.02
Frequency of Pain												
Pain does not interfere with activity	8.1%	8.1%	0.00	8.1%	8.4%	-0.01	10.8%	8.3%	0.08	9.1%	9.8%	-0.02
Less often than daily	9.7%	10.7%	-0.04	9.7%	8.4%	0.04	10.6%	10.2%	0.02	10.5%	13.6%	-0.10
Daily, but not constant	46.3%	46.7%	-0.01	40.7%	38.0%	0.05	39.0%	41.4%	-0.05	40.2%	46.9%	-0.14
Constant	15.4%	15.2%	0.01	15.9%	15.7%	0.01	11.0%	13.3%	-0.07	17.0%	12.2%	0.13
Bathing												
With the use of devices in shower/tub	6.1%	7.2%	-0.04	6.1%	6.7%	-0.02	6.7%	6.6%	0.01	5.6%	4.6%	0.04
With intermittent assistance in shower/tub	20.1%	20.8%	-0.02	17.2%	17.9%	-0.02	17.1%	19.1%	-0.05	15.9%	16.2%	-0.01
Participates with supervision in shower/tub	42.0%	40.0%	0.04	39.6%	39.7%	0.00	32.8%	37.7%	-0.11	36.9%	37.6%	-0.01
Independent at sink, in chair, or on commode	7.2%	7.2%	0.00	6.2%	7.7%	-0.06	11.5%	8.3%	0.10	10.2%	9.8%	0.01
Participates with assist at sink, in chair, or commode	14.3%	14.1%	0.00	19.5%	16.7%	0.07	21.1%	17.3%	0.09	20.7%	20.9%	-0.01

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
Unable to participate; bathed totally by another	7.4%	7.6%	-0.01	5.4%	5.5%	-0.01	8.7%	7.4%	0.05	7.8%	9.1%	-0.05
Bed Transfer												
Able to transfer with minimal human assistance or with use of an assistive device	56.7%	56.7%	0.00	52.0%	57.9%	-0.12	60.5%	57.2%	0.07	58.9%	54.8%	0.08
Able to bear weight and pivot during the transfer but unable to transfer self	25.9%	24.3%	0.04	26.7%	20.8%	0.13	21.6%	23.5%	-0.04	21.5%	27.6%	-0.15
Unable to transfer self and is unable to bear weight or pivot when transferred by another person	5.7%	6.4%	-0.03	3.8%	3.9%	-0.01	6.8%	5.4%	0.06	5.1%	7.8%	-0.12
Bedfast, unable to transfer but is able to turn and position self in bed	0.6%	0.7%	-0.01	0.3%	0.4%	-0.01	0.7%	0.6%	0.01	0.7%	1.0%	-0.04
Bedfast, unable to transfer and is unable to turn and position self	1.5%	1.8%	-0.02	0.9%	1.0%	0.00	1.8%	1.6%	0.01	1.7%	2.3%	-0.05
Surgical Wound												
Fully granulating	1.2%	1.3%	-0.01	0.9%	1.1%	-0.02	1.0%	1.0%	0.00	1.0%	1.1%	-0.01
Early/ partial granulation	2.8%	3.0%	-0.01	1.8%	2.5%	-0.06	2.2%	2.3%	0.00	2.7%	2.6%	0.01
Not healing	9.2%	10.1%	-0.03	9.9%	10.9%	-0.03	11.2%	12.4%	-0.04	9.9%	10.4%	-0.01

**Standardized Difference in means. | †Regional grouping does not include the HHVBP state. See Exhibit A-13 above. | ‡2013-2015 values are listed as "N/A" since ACO Next Generation and BPCI Advanced started after 2015. Shading indicates that the absolute standardized differences of means is greater than 0.25.*

Exhibit C-37. Beneficiary and Agency Characteristics 2013-2015, National, Nebraska, Tennessee, and Washington and their Corresponding Comparison Group

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
Beneficiary Characteristics (Claims)												
Average age	77.0	75.8	0.10	77.8	75.3	0.20	76.3	75.3	0.08	78.4	77.2	0.10
Age categories												
Age 0 - 64	13.0%	15.6%	-0.08	11.9%	17.2%	-0.17	14.6%	17.1%	-0.07	10.7%	12.6%	-0.06
Age 65 - 84	56.3%	56.9%	-0.01	54.8%	55.9%	-0.02	57.4%	56.7%	0.01	54.0%	55.6%	-0.03
Age 85 and Older	30.8%	27.5%	0.07	33.4%	26.9%	0.14	28.0%	26.3%	0.04	35.3%	31.8%	0.07
Female	62.1%	62.8%	-0.01	63.3%	62.7%	0.01	65.2%	63.1%	0.04	61.3%	60.0%	0.03
Race/Ethnicity												
Hispanic (regardless of race)	9.5%	8.5%	0.03	1.5%	1.0%	0.04	0.3%	3.9%	-0.65	1.8%	2.1%	-0.03
Black, non-Hispanic	10.1%	16.5%	-0.21	4.6%	11.8%	-0.34	11.5%	25.1%	-0.43	2.3%	0.9%	0.10
White, non-Hispanic	79.1%	71.8%	0.18	93.0%	86.4%	0.26	87.7%	68.4%	0.59	91.7%	91.2%	0.02
Other, non-Hispanic	1.2%	3.0%	-0.17	0.8%	0.6%	0.02	0.4%	2.4%	-0.32	4.0%	5.5%	-0.08
Multiracial, non-Hispanic	0.1%	0.2%	-0.02	0.1%	0.2%	-0.01	0.1%	0.2%	-0.01	0.2%	0.3%	-0.02
Dual Eligible	30.3%	34.5%	-0.09	19.7%	27.0%	-0.18	33.9%	35.9%	-0.04	24.4%	26.8%	-0.06
Rural	5.1%	9.6%	-0.20	15.1%	9.6%	0.15	19.5%	10.2%	0.23	3.1%	8.4%	-0.31
Reason for Medicare Entitlement												
Original ESRD	1.2%	1.6%	-0.04	1.2%	1.4%	-0.02	1.4%	1.2%	0.01	0.9%	1.2%	-0.03
Original Disabled	25.3%	28.8%	-0.08	23.0%	31.2%	-0.20	31.5%	31.8%	-0.01	23.0%	25.7%	-0.07
Current ESRD	0.8%	1.1%	-0.03	0.8%	0.9%	-0.01	0.9%	0.8%	0.01	0.5%	0.8%	-0.03
Current Disabled	12.1%	14.4%	-0.07	11.0%	16.1%	-0.16	13.4%	16.0%	-0.07	10.0%	11.6%	-0.06
HHA Characteristics												
Ownership												
For-profit	71.0%	69.5%	0.03	39.1%	59.1%	-0.41	86.0%	70.7%	0.44	55.8%	55.5%	0.00
Non-profit	25.9%	28.0%	-0.05	53.3%	37.4%	0.32	12.1%	26.1%	-0.43	30.7%	39.4%	-0.19
Government-owned	3.1%	2.5%	0.04	7.6%	3.5%	0.15	1.9%	3.2%	-0.10	13.6%	5.1%	0.25
Setting												
Hospital-based	8.4%	11.1%	-0.10	39.4%	17.7%	0.44	4.9%	13.8%	-0.41	25.3%	24.5%	0.02
Freestanding	91.6%	88.9%	0.10	60.6%	82.3%	-0.44	95.1%	86.2%	0.41	74.7%	75.5%	-0.02
Chain affiliation												
Chain = Yes	42.3%	57.8%	-0.31	66.5%	49.3%	0.36	20.4%	63.3%	-1.06	32.1%	36.2%	-0.09
Chain = No	54.6%	40.1%	0.29	31.6%	48.0%	-0.35	79.4%	33.0%	1.15	64.0%	61.6%	0.05

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
Chain = Missing	3.1%	2.1%	0.06	1.9%	2.7%	-0.05	0.2%	3.7%	-0.82	3.8%	2.2%	0.08
HHA Age												
HHA age < 4 years	7.3%	6.8%	0.02	3.0%	6.1%	-0.18	0.6%	8.5%	-0.99	2.1%	4.9%	-0.20
HHA age 4-10 years	25.4%	24.0%	0.03	26.4%	22.2%	0.10	5.1%	31.7%	-1.21	3.5%	13.5%	-0.54
HHA age > 10 years	67.3%	69.1%	-0.04	70.6%	71.7%	-0.02	94.3%	59.8%	1.48	94.4%	81.6%	0.56
Agency Size												
HHAs with 1-59 OASIS Episodes	1.3%	3.4%	-0.19	4.1%	2.4%	0.09	0.2%	2.5%	-0.56	0.1%	1.6%	-0.57
HHAs with 60-249 OASIS Episodes	7.5%	15.6%	-0.31	13.5%	11.4%	0.06	2.0%	18.8%	-1.19	2.2%	12.9%	-0.74
HHAs with 250-499 OASIS Episodes	11.1%	14.7%	-0.11	24.0%	12.7%	0.27	5.9%	18.0%	-0.52	6.6%	17.1%	-0.42
HHAs with 500-999 OASIS Episodes	17.1%	16.8%	0.01	10.1%	19.5%	-0.31	18.2%	17.0%	0.03	17.1%	22.2%	-0.13
HHAs with 1000+ OASIS Episodes	63.0%	49.5%	0.28	48.3%	54.0%	-0.12	73.7%	43.6%	0.68	74.0%	46.1%	0.63
APMs												
BPCI2	0.9%	0.9%	0.01	0.7%	0.8%	-0.01	1.3%	0.6%	0.07	0.9%	0.4%	0.05
BPCI3	0.1%	0.2%	-0.02	0.0%	0.1%	-0.08	0.0%	0.5%	-0.25	0.2%	0.4%	-0.05
BPCI Advanced‡	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACO SSP	18.2%	14.7%	0.09	19.0%	17.1%	0.05	15.3%	17.9%	-0.07	10.3%	8.9%	0.05
ACO Next Generation‡	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ACO Pioneer‡	4.5%	2.0%	0.12	0.1%	0.7%	-0.18	0.1%	2.0%	-0.86	0.2%	0.2%	-0.01
HCC Score (1st episode)	2.7	2.6	0.04	2.6	2.8	-0.15	2.7	2.6	0.02	2.8	2.6	0.11
ESRD Flag	2.9%	3.7%	-0.05	2.6%	3.4%	-0.05	3.1%	3.3%	-0.01	2.5%	2.7%	-0.01
Beneficiary Characteristics (OASIS)												
Inpatient discharge within 14 days	67.8%	71.4%	-0.08	75.1%	75.1%	0.00	68.8%	66.8%	0.04	71.7%	68.7%	0.07
Ambulation and Locomotion												
Requires two handed device for level ground or human assistance for stairs and uneven ground	32.3%	32.8%	-0.01	34.0%	33.1%	0.02	25.4%	33.0%	-0.17	30.3%	31.8%	-0.03

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
Walks only with supervision or assistance from another at all times	42.6%	40.2%	0.05	45.6%	39.1%	0.13	49.7%	39.9%	0.20	43.3%	41.0%	0.05
Chairfast to bedfast	11.2%	11.9%	-0.02	8.9%	11.4%	-0.09	14.7%	11.2%	0.10	18.3%	16.6%	0.04
Management of Oral Medications												
Able to take medications at the correct time if given reminders by another person at the appropriate times	15.1%	16.4%	-0.04	12.4%	15.5%	-0.10	17.0%	17.4%	-0.01	17.4%	15.5%	0.05
Unable to take medication unless administered by another person	32.7%	30.6%	0.04	41.2%	28.3%	0.26	37.2%	28.0%	0.19	41.1%	38.9%	0.05
Patient is receiving psychiatric nursing services	2.1%	1.4%	0.05	0.8%	1.4%	-0.07	2.4%	1.3%	0.07	1.3%	1.4%	-0.02
Risk for Hospitalization												
Multiple hospitalizations in past 6 months	36.4%	37.1%	-0.01	40.2%	41.5%	-0.03	42.4%	37.8%	0.09	35.2%	34.2%	0.02
History of falls	32.8%	31.4%	0.03	38.7%	34.2%	0.09	40.2%	31.3%	0.18	39.1%	40.2%	-0.02
Currently taking 5 or more medications	88.3%	87.0%	0.04	88.4%	88.3%	0.00	89.2%	88.9%	0.01	84.7%	85.5%	-0.02
Recent decline in mental, emotional, or behavioral status	16.1%	14.9%	0.03	18.1%	14.7%	0.09	18.1%	14.7%	0.09	19.0%	18.6%	0.01
Frailty	33.6%	34.0%	-0.01	39.8%	33.9%	0.12	36.4%	35.8%	0.01	37.8%	34.9%	0.06
Skin Lesion or Open Wound that is not a Stasis Ulcer or Surgical Wound	23.1%	24.1%	-0.03	35.7%	24.4%	0.23	24.6%	24.7%	0.00	23.6%	19.1%	0.11
Short of Breath												
When walking more than 20ft, climbing stairs	25.2%	23.7%	0.04	26.3%	25.4%	0.02	21.5%	24.7%	-0.08	24.9%	23.4%	0.03
With moderate exertion	31.4%	30.7%	0.02	27.3%	28.1%	-0.02	35.1%	33.8%	0.03	24.1%	22.2%	0.04

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
With minimal exertion or at rest	15.9%	17.5%	-0.04	16.2%	18.1%	-0.05	26.8%	17.4%	0.21	13.7%	13.2%	0.01
Surgical Wound	24.4%	25.6%	-0.03	28.9%	27.2%	0.04	21.4%	23.8%	-0.06	24.6%	25.1%	-0.01
Requiring urinary catheter	4.4%	4.6%	-0.01	5.5%	4.7%	0.03	4.5%	4.4%	0.01	6.3%	6.5%	-0.01
Acute Conditions												
Requires Oxygen therapy	14.3%	16.2%	-0.05	18.7%	19.6%	-0.02	23.5%	16.5%	0.17	14.7%	19.4%	-0.13
Orthopedic	43.0%	38.4%	0.09	44.0%	37.0%	0.14	40.2%	41.0%	-0.02	39.3%	38.8%	0.01
Pressure Ulcer												
Unhealed Pressure Ulcer Stage 2 or Higher	4.8%	5.2%	-0.02	5.2%	5.0%	0.01	6.2%	4.9%	0.05	7.2%	6.9%	0.01
Pressure Ulcer Stage 2	3.2%	3.4%	-0.01	3.6%	3.4%	0.01	4.1%	3.3%	0.04	4.5%	4.5%	0.00
Pressure Ulcer Stage 3	0.9%	1.0%	-0.01	0.9%	0.9%	0.00	1.2%	0.9%	0.02	1.4%	1.3%	0.01
Pressure Ulcer Stage 4	0.5%	0.6%	-0.01	0.4%	0.6%	-0.02	0.7%	0.6%	0.02	0.6%	0.6%	0.00
Pressure Ulcer Not Stageable	0.9%	1.1%	-0.01	1.0%	1.0%	0.01	1.3%	0.9%	0.03	1.8%	1.5%	0.02
Diagnosed with Neoplasm	8.1%	8.7%	-0.02	9.8%	8.6%	0.04	6.9%	8.1%	-0.04	8.1%	8.0%	0.00
Frequency of Pain												
Pain does not interfere with activity	8.1%	8.1%	0.00	9.5%	8.7%	0.03	9.5%	7.1%	0.08	9.6%	11.3%	-0.06
Less often than daily	9.7%	10.7%	-0.04	10.3%	10.2%	0.00	13.3%	10.7%	0.08	8.7%	8.7%	0.00
Daily, but not constant	46.3%	46.7%	-0.01	41.6%	42.5%	-0.02	49.6%	49.6%	0.00	39.3%	40.5%	-0.02
Constant	15.4%	15.2%	0.01	19.1%	19.6%	-0.01	15.8%	16.3%	-0.01	22.8%	18.5%	0.10
Bathing												
With the use of devices in shower/tub	6.1%	7.2%	-0.04	8.7%	7.7%	0.04	3.9%	8.1%	-0.21	5.9%	7.7%	-0.07
With intermittent assistance in shower/tub	20.1%	20.8%	-0.02	21.1%	19.1%	0.05	15.2%	22.8%	-0.21	17.8%	20.9%	-0.08
Participates with supervision in shower/tub	42.0%	40.0%	0.04	46.3%	37.2%	0.18	42.8%	40.0%	0.06	47.9%	46.1%	0.03
Independent at sink, in chair, or on commode	7.2%	7.2%	0.00	6.2%	8.7%	-0.10	8.3%	7.2%	0.04	5.5%	4.6%	0.04
Participates with assist at sink, in chair, or commode	14.3%	14.1%	0.00	9.4%	17.2%	-0.27	18.4%	12.7%	0.15	9.4%	8.3%	0.04

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
Unable to participate; bathed totally by another	7.4%	7.6%	-0.01	4.7%	6.2%	-0.07	10.1%	6.8%	0.11	11.5%	9.0%	0.08
Bed Transfer												
Able to transfer with minimal human assistance or with use of an assistive device	56.7%	56.7%	0.00	60.2%	55.9%	0.09	50.8%	59.6%	-0.18	52.8%	53.7%	-0.02
Able to bear weight and pivot during the transfer but unable to transfer self	25.9%	24.3%	0.04	21.7%	23.0%	-0.03	32.9%	23.0%	0.21	28.3%	25.2%	0.07
Unable to transfer self and is unable to bear weight or pivot when transferred by another person	5.7%	6.4%	-0.03	3.7%	5.9%	-0.12	8.4%	5.7%	0.10	7.6%	7.0%	0.02
Bedfast, unable to transfer but is able to turn and position self in bed	0.6%	0.7%	-0.01	0.3%	0.6%	-0.06	1.0%	0.7%	0.03	0.6%	0.7%	-0.01
Bedfast, unable to transfer and is unable to turn and position self	1.5%	1.8%	-0.02	0.9%	1.5%	-0.07	2.3%	1.6%	0.04	2.1%	1.9%	0.01
Surgical Wound												
Fully granulating	1.2%	1.3%	-0.01	1.2%	1.5%	-0.03	1.3%	1.2%	0.01	1.3%	1.5%	-0.01
Early/ partial granulation	2.8%	3.0%	-0.01	3.4%	3.3%	0.01	2.7%	2.7%	0.00	2.9%	3.2%	-0.02
Not healing	9.2%	10.1%	-0.03	13.9%	11.3%	0.07	7.0%	10.4%	-0.14	8.6%	8.9%	-0.01

**Standardized Difference in means. | †Regional grouping does not include the HHVBP state. See Exhibit A-13 above. | ‡2013-2015 values are listed as "N/A" since ACO Next Generation and BPCI Advanced started after 2015. Shading indicates that the absolute standardized differences of means is greater than 0.25.*

Exhibit C-38. Measure Outcomes 2013-2015, National, Arizona, Florida, and Iowa and their Corresponding Comparison Group

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
FFS Claims-Based Quality Measures												
ED Use (no Hospitalization)/First FFS HH Episodes	11.7%	12.3%	-0.02	13.1%	11.7%	0.04	9.9%	12.6%	-0.09	14.0%	13.0%	0.03
Unplanned Acute Care Hospitalization/First FFS HH Episodes	15.7%	16.3%	-0.02	15.8%	14.0%	0.05	14.0%	14.2%	-0.01	17.3%	17.2%	0.00
Unplanned Acute Care Hospitalization/All FFS HH Episodes	17.0%	15.9%	0.03	16.9%	14.9%	0.05	15.6%	12.2%	0.09	18.3%	18.1%	0.01
Unplanned Hospital Readmission in the First 30 Days of HH Care	13.0%	13.0%	0.00	11.9%	11.5%	0.01	13.0%	12.0%	0.03	13.2%	13.8%	-0.02
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	9.7%	10.0%	-0.01	10.0%	10.0%	0.00	8.4%	10.4%	-0.07	11.3%	10.9%	0.02
SNF Use/All FFS HH Episodes	4.9%	4.0%	0.04	4.4%	3.9%	0.02	4.1%	2.4%	0.09	6.6%	6.1%	0.02
FFS Claims-Based Spending Measures												
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes	$33.6	$32.1	0.00	$36.5	$37.4	0.00	$27.7	$21.3	0.01	$35.0	$37.4	0.00
Average Medicare Spending per Day during and following FFS HH Episodes of Care	$138.3	$131.6	0.00	$151.5	$148.8	0.00	$133.2	$109.8	0.02	$132.7	$137.4	0.00
Average Medicare Spending per Day during FFS HH Episodes of Care	$150.6	$135.3	0.01	$170.2	$159.9	0.01	$145.9	$105.0	0.03	$149.8	$154.8	0.00
Average Medicare Spending per Day following FFS HH Episodes of Care	$106.0	$116.6	-0.01	$112.3	$116.8	0.00	$99.6	$137.5	-0.03	$95.3	$100.0	0.00

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
OASIS-Based Outcome Quality Measures												
Discharged to Community	72.8%	70.1%	0.06	76.3%	75.8%	0.01	75.2%	59.5%	0.36	67.4%	71.9%	-0.10
Improvement in Ambulation-Locomotion	65.2%	62.8%	0.05	61.6%	61.3%	0.01	64.8%	56.4%	0.18	66.0%	61.9%	0.09
Improvement in Bathing	70.5%	68.0%	0.06	67.0%	67.4%	-0.01	73.2%	62.9%	0.23	71.4%	63.9%	0.17
Improvement in Bed Transferring	61.1%	58.4%	0.06	58.5%	56.3%	0.05	60.4%	50.6%	0.20	64.5%	60.1%	0.09
Improvement in Dyspnea	66.7%	66.1%	0.01	68.7%	68.6%	0.00	64.0%	55.9%	0.17	69.1%	65.9%	0.07
Improvement in Management of Oral Medications	51.5%	53.9%	-0.05	50.2%	50.3%	0.00	46.9%	48.2%	-0.03	62.3%	50.4%	0.25
Improvement in Pain Interfering with Activity	70.7%	67.7%	0.07	65.2%	71.0%	-0.12	75.3%	59.6%	0.36	70.3%	65.9%	0.10
Improvement in Status of Surgical Wounds	90.3%	89.2%	0.04	85.5%	89.6%	-0.12	91.9%	89.2%	0.10	86.4%	86.3%	0.00
OASIS-Based Process Quality Measures												
Influenza Immunization Received for Current Flu Season	61.8%	64.9%	-0.10	64.6%	65.9%	-0.05	56.5%	66.5%	-0.30	69.3%	68.0%	0.05
Pneumococcal Polysaccharide Vaccine Ever Received	66.1%	68.2%	-0.07	70.4%	67.8%	0.11	59.6%	69.7%	-0.32	79.2%	78.8%	0.02
Depression Assessment Conducted	95.8%	95.2%	0.04	92.0%	95.4%	-0.18	96.7%	94.7%	0.16	95.0%	94.9%	0.01
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	92.5%	94.1%	-0.11	93.5%	94.9%	-0.10	92.1%	94.4%	-0.14	92.0%	91.4%	0.04
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	98.3%	98.4%	-0.01	97.9%	98.8%	-0.14	98.9%	98.5%	0.08	97.8%	97.5%	0.04
Timely Initiation of Care	92.6%	89.8%	0.27	90.1%	91.4%	-0.11	94.1%	90.0%	0.41	93.3%	88.4%	0.56

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	AZ	AZ Regional Group.†	Std. Diff.	FL	FL Regional Group.†	Std. Diff.	IA	IA Regional Group.†	Std. Diff.
HHCAHPS-Based Patient Experience Measures												
How often the home health team gave care in a professional way	88.8%	88.2%	0.11	86.7%	86.1%	0.11	89.0%	89.6%	-0.09	88.4%	87.3%	0.25
How well did the home health team communicate with patients	85.9%	85.3%	0.11	83.5%	83.0%	0.07	85.7%	86.3%	-0.09	86.6%	84.8%	0.38
Did the home health team discuss medicines, pain, and home safety with patients	82.8%	83.8%	-0.13	79.9%	81.6%	-0.23	81.9%	85.8%	-0.49	86.1%	83.2%	0.49
How do patients rate the overall care from the home health agency	84.4%	83.7%	0.09	80.5%	80.3%	0.02	84.5%	85.6%	-0.13	85.5%	82.4%	0.43
Would patients recommend the home health agency to friends and family	79.6%	78.4%	0.12	75.1%	74.8%	0.02	79.2%	80.8%	-0.14	80.6%	77.7%	0.33

**Standardized Difference in means. | †Regional grouping does not include the HHVBP state. See Exhibit A-13 above. | Shading indicates that the absolute standardized differences of means is greater than 0.25. | HHVBP Measures indicated by italicized text.*

Exhibit C-39. Measure Outcomes 2013-2015, National, Massachusetts, Maryland, and North Carolina and their Corresponding Comparison Group

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
FFS Claims-Based Quality Measures												
ED Use (no Hospitalization)/First FFS HH Episodes	11.7%	12.3%	-0.02	12.5%	13.8%	-0.04	12.0%	10.9%	0.03	14.3%	13.2%	0.03
Unplanned Acute Care Hospitalization/First FFS HH Episodes	15.7%	16.3%	-0.02	16.9%	16.7%	0.00	18.4%	18.4%	0.00	16.7%	16.9%	-0.01
Unplanned Acute Care Hospitalization/All FFS HH Episodes	17.0%	15.9%	0.03	19.1%	18.5%	0.01	20.2%	20.2%	0.00	18.2%	17.7%	0.01
Unplanned Hospital Readmission in the First 30 Days of HH Care	13.0%	13.0%	0.00	13.2%	12.8%	0.01	13.3%	14.0%	-0.02	12.7%	12.9%	-0.01
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	9.7%	10.0%	-0.01	9.7%	10.8%	-0.04	9.7%	8.7%	0.03	10.8%	10.6%	0.01
SNF Use/All FFS HH Episodes	4.9%	4.0%	0.04	6.9%	7.1%	-0.01	6.0%	5.6%	0.02	4.6%	4.1%	0.03
FFS Claims-Based Spending Measures												
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes	$33.6	$32.1	0.00	$44.9	$41.9	0.00	$55.9	$47.6	0.01	$35.6	$32.0	0.00
Average Medicare Spending per Day during and following FFS HH Episodes of Care	$138.3	$131.6	0.00	$156.9	$149.5	0.00	$172.2	$162.1	0.01	$130.6	$128.5	0.00
Average Medicare Spending per Day during FFS HH Episodes of Care	$150.6	$135.3	0.01	$173.4	$167.2	0.00	$192.6	$180.5	0.01	$143.5	$136.5	0.01
Average Medicare Spending per Day following FFS HH Episodes of Care	$106.0	$116.6	-0.01	$116.4	$106.9	0.01	$129.1	$121.9	0.00	$99.4	$103.9	0.00

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
OASIS-Based Outcome Quality Measures												
Discharged to Community	72.8%	70.1%	0.06	68.8%	69.3%	-0.01	74.5%	74.0%	0.01	73.5%	69.6%	0.09
Improvement in Ambulation-Locomotion	65.2%	62.8%	0.05	69.0%	63.4%	0.12	69.0%	64.7%	0.09	64.9%	67.4%	-0.05
Improvement in Bathing	70.5%	68.0%	0.06	70.4%	67.0%	0.08	73.7%	69.3%	0.10	67.4%	71.9%	-0.09
Improvement in Bed Transferring	61.1%	58.4%	0.06	65.2%	58.5%	0.14	64.6%	61.3%	0.07	60.3%	62.5%	-0.04
Improvement in Dyspnea	66.7%	66.1%	0.01	69.4%	64.9%	0.10	75.6%	69.3%	0.15	68.7%	70.7%	-0.04
Improvement in Management of Oral Medications	51.5%	53.9%	-0.05	61.4%	54.2%	0.15	59.0%	58.3%	0.02	49.0%	57.2%	-0.16
Improvement in Pain Interfering with Activity	70.7%	67.7%	0.07	71.4%	66.7%	0.10	70.3%	70.1%	0.00	67.3%	68.7%	-0.03
Improvement in Status of Surgical Wounds	90.3%	89.2%	0.04	92.7%	89.9%	0.11	90.5%	88.9%	0.06	89.9%	91.1%	-0.04
OASIS-Based Process Quality Measures												
Influenza Immunization Received for Current Flu Season	61.8%	64.9%	-0.10	65.3%	66.8%	-0.06	68.6%	66.0%	0.11	68.2%	66.4%	0.08
Pneumococcal Polysaccharide Vaccine Ever Received	66.1%	68.2%	-0.07	66.4%	71.3%	-0.19	75.9%	69.4%	0.42	74.7%	71.0%	0.24
Depression Assessment Conducted	95.8%	95.2%	0.04	93.6%	95.8%	-0.14	97.3%	93.6%	0.55	96.2%	96.4%	-0.03
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	92.5%	94.1%	-0.11	93.5%	93.1%	0.03	93.5%	93.6%	-0.01	92.6%	93.5%	-0.09
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	98.3%	98.4%	-0.01	96.8%	97.8%	-0.11	97.4%	97.4%	0.00	97.5%	97.6%	-0.02
Timely Initiation of Care	92.6%	89.8%	0.27	92.6%	92.5%	0.01	90.2%	91.8%	-0.16	89.8%	91.0%	-0.14

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	MA	MA Regional Group.†	Std. Diff.	MD	MD Regional Group.†	Std. Diff.	NC	NC Regional Group.†	Std. Diff.
HHCAHPS-Based Patient Experience Measures												
How often the home health team gave care in a professional way	88.8%	88.2%	0.11	88.3%	87.4%	0.21	87.5%	87.4%	0.01	90.0%	89.5%	0.14
How well did the home health team communicate with patients	85.9%	85.3%	0.11	85.4%	85.3%	0.02	84.7%	85.4%	-0.13	87.5%	87.0%	0.13
Did the home health team discuss medicines, pain, and home safety with patients	82.8%	83.8%	-0.13	84.5%	82.8%	0.31	81.2%	83.3%	-0.30	84.9%	84.1%	0.17
How do patients rate the overall care from the home health agency	84.4%	83.7%	0.09	84.4%	83.6%	0.11	82.2%	83.2%	-0.13	86.4%	85.6%	0.15
Would patients recommend the home health agency to friends and family	79.6%	78.4%	0.12	81.0%	80.7%	0.04	76.6%	77.7%	-0.12	81.8%	81.4%	0.06

**Standardized Difference in means. | †Regional grouping does not include the HHVBP state. See Exhibit A-13 above. | Shading indicates that the absolute standardized differences of means is greater than 0.25. | HHVBP Measures indicated by italicized text.*

Exhibit C-40. Measure Outcomes 2013-2015, National, Nebraska, Tennessee, and Washington and their Corresponding Comparison Group

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
FFS Claims-Based Quality Measures												
ED Use (no Hospitalization)/First FFS HH Episodes	11.7%	12.3%	-0.02	11.7%	13.3%	-0.05	13.0%	11.9%	0.03	14.4%	14.8%	-0.01
Unplanned Acute Care Hospitalization/First FFS HH Episodes	15.7%	16.3%	-0.02	16.9%	17.7%	-0.02	17.5%	16.4%	0.03	15.4%	14.4%	0.03
Unplanned Acute Care Hospitalization/All FFS HH Episodes	17.0%	15.9%	0.03	17.3%	18.3%	-0.03	17.2%	16.6%	0.02	16.0%	14.7%	0.04
Unplanned Hospital Readmission in the First 30 Days of HH Care	13.0%	13.0%	0.00	13.7%	13.6%	0.00	14.6%	13.8%	0.02	12.0%	11.2%	0.03
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	9.7%	10.0%	-0.01	9.7%	10.6%	-0.03	11.0%	10.1%	0.03	11.7%	12.1%	-0.02
SNF Use/All FFS HH Episodes	4.9%	4.0%	0.04	6.7%	5.3%	0.06	5.0%	4.3%	0.03	4.9%	4.0%	0.04
FFS Claims-Based Spending Measures												
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes	$33.6	$32.1	0.00	$32.6	$34.5	0.00	$28.6	$32.4	-0.01	$35.4	$32.7	0.00
Average Medicare Spending per Day during and following FFS HH Episodes of Care	$138.3	$131.6	0.00	$136.5	$136.4	0.00	$121.9	$126.9	0.00	$140.9	$128.5	0.01
Average Medicare Spending per Day during FFS HH Episodes of Care	$150.6	$135.3	0.01	$150.4	$144.0	0.00	$123.4	$132.0	-0.01	$156.5	$141.1	0.01
Average Medicare Spending per Day following FFS HH Episodes of Care	$106.0	$116.6	-0.01	$104.1	$113.9	-0.01	$113.9	$109.8	0.00	$103.6	$93.4	0.01

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
OASIS-Based Outcome Quality Measures												
Discharged to Community	72.8%	70.1%	0.06	73.1%	68.9%	0.10	65.9%	71.4%	-0.11	75.3%	74.7%	0.01
Improvement in Ambulation-Locomotion	65.2%	62.8%	0.05	64.4%	64.6%	0.00	66.2%	63.8%	0.05	57.0%	57.9%	-0.02
Improvement in Bathing	70.5%	68.0%	0.06	66.7%	69.2%	-0.05	69.4%	70.0%	-0.01	59.8%	60.3%	-0.01
Improvement in Bed Transferring	61.1%	58.4%	0.06	60.2%	61.8%	-0.03	60.8%	58.6%	0.04	55.4%	55.7%	-0.01
Improvement in Dyspnea	66.7%	66.1%	0.01	67.4%	66.4%	0.02	66.5%	67.7%	-0.03	65.1%	65.2%	0.00
Improvement in Management of Oral Medications	51.5%	53.9%	-0.05	51.3%	54.7%	-0.07	54.2%	56.2%	-0.04	42.9%	42.0%	0.02
Improvement in Pain Interfering with Activity	70.7%	67.7%	0.07	68.3%	66.5%	0.04	64.0%	71.0%	-0.15	61.4%	62.3%	-0.02
Improvement in Status of Surgical Wounds	90.3%	89.2%	0.04	83.6%	89.0%	-0.15	88.8%	88.7%	0.00	87.2%	87.5%	-0.01
OASIS-Based Process Quality Measures												
Influenza Immunization Received for Current Flu Season	61.8%	64.9%	-0.10	70.9%	62.0%	0.31	69.4%	60.9%	0.39	68.9%	66.1%	0.13
Pneumococcal Polysaccharide Vaccine Ever Received	66.1%	68.2%	-0.07	81.1%	67.3%	0.63	74.0%	61.9%	0.65	76.6%	74.6%	0.13
Depression Assessment Conducted	95.8%	95.2%	0.04	94.1%	94.1%	0.00	95.7%	97.1%	-0.11	94.7%	95.5%	-0.08
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	92.5%	94.1%	-0.11	92.9%	92.7%	0.02	93.5%	95.3%	-0.17	91.9%	91.6%	0.04
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	98.3%	98.4%	-0.01	98.8%	97.8%	0.23	97.4%	98.9%	-0.21	98.3%	98.3%	-0.01
Timely Initiation of Care	92.6%	89.8%	0.27	92.7%	89.1%	0.37	90.0%	87.9%	0.22	83.4%	86.9%	-0.26

Characteristics	HHVBP	Non-HHVBP	Std. Diff.*	NE	NE Regional Group.†	Std. Diff.	TN	TN Regional Group.†	Std. Diff.	WA	WA Regional Group.†	Std. Diff.
HHCAHPS-Based Patient Experience Measures												
How often the home health team gave care in a professional way	88.8%	88.2%	0.11	88.3%	88.2%	0.03	90.1%	88.5%	0.46	86.6%	87.8%	-0.31
How well did the home health team communicate with patients	85.9%	85.3%	0.11	86.6%	85.6%	0.19	87.6%	85.1%	0.65	83.9%	85.1%	-0.26
Did the home health team discuss medicines, pain, and home safety with patients	82.8%	83.8%	-0.13	83.3%	83.1%	0.02	84.5%	84.0%	0.12	80.6%	81.2%	-0.12
How do patients rate the overall care from the home health agency	84.4%	83.7%	0.09	83.9%	84.1%	-0.01	86.2%	83.6%	0.47	80.4%	82.4%	-0.35
Would patients recommend the home health agency to friends and family	79.6%	78.4%	0.12	79.9%	78.1%	0.19	82.6%	77.6%	0.74	76.7%	79.5%	-0.41

**Standardized Difference in means. | †Regional grouping does not include the HHVBP state. See Exhibit A-13 above. | Shading indicates that the absolute standardized differences of means is greater than 0.25. | HHVBP Measures indicated by italicized text.*

C.11.2 State-Level Falsification Results

Exhibit C-41. Falsification Results Assessing the Impact of HHVBP in 2015 for HHVBP states, Relative to Regional State Grouping as Comparison Group

Measures	National Level[a]	AZ[a]	FL[a]	IA[a]	MA[a]	MD[a]	NC[a]	NE[a]	TN[a]	WA[a]
FFS Claims-Based Quality Measures										
ED Use (no Hospitalization)/First FFS HH Episodes*	0.05	0.55*	-0.08	-0.84**	-0.10	0.21	-0.01	-0.39	0.19	0.42
Unplanned Acute Care Hospitalization/First FFS HH Episodes*	0.02	-0.10	-0.05	0.38	0.29	-1.17**	-0.21	0.19	0.35	-0.62*
Unplanned Acute Care Hospitalization/All FFS HH Episodes	0.03	-0.10	0.01	0.15	0.15	-1.24**	-0.33*	0.45	0.50**	-0.51
Unplanned Hospital Readmission in the First 30 Days of HH Care	0.19	0.40	0.19	0.33	0.18	-0.80**	0.06	-0.26	0.77**	-0.42
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care	-0.04	-0.02	-0.24	-0.16	0.32	-0.05	-0.13	-0.56	0.21	0.74
SNF Use/All FFS HH Episodes	-0.06	0.17	-0.19**	0.49**	0.14	-0.34**	-0.08	-0.01	0.25**	-0.05
FFS Claims-Based Spending Measures										
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes*	$0.12	$0.02	-$0.06	$1.63*	$1.38	-$4.32**	-$0.95**	$2.21**	$1.03**	-$0.80
Average Medicare Spending per Day during and following FFS HH Episodes of Care*	-$0.81**	-$0.27	-$1.68**	$3.17**	$2.80*	-$8.14**	-$1.71**	$6.07**	$1.51*	-$1.97
Average Medicare Spending per Day during FFS HH Episodes of Care*	-$1.03**	-$1.40	-$2.47**	$4.20**	$3.02*	-$6.99**	-$2.83**	$6.82**	$1.47	-$1.22
Average Medicare Spending per Day following FFS HH Episodes of Care*	-$0.95*	-$1.26	-$0.91	$2.14	$1.84	-$10.10**	-$0.26	$2.91	$1.61	-$2.39
OASIS-Based Outcome Quality Measures										
Discharged to Community*	-0.64**	-0.25	-1.42**	-0.22	-1.11**	0.17	-0.17	-0.90	0.69*	1.59**
Improvement in Ambulation-Locomotion*	-0.27	-1.71**	-0.11	-0.40	-0.43	-1.05	0.85*	0.63	1.54**	2.04**
Improvement in Bathing	-0.30	-0.97	-0.42	-1.03	-0.28	-1.02	1.13**	0.78	1.95**	2.35**
Improvement in Bed Transferring	-0.11	-0.98	-0.20	-0.26	-0.12	-1.91*	0.53	2.07**	2.03**	0.69
Improvement in Dyspnea	0.66*	-0.56	1.51**	0.70	-1.32	-2.12**	0.91	0.59	1.74**	3.23**
Improvement in Management of Oral Medications	0.65*	-1.55	0.68	-2.07**	0.25	-0.87	1.78*	1.82	2.03**	1.11

Measures	National Level[a]	AZ[a]	FL[a]	IA[a]	MA[a]	MD[a]	NC[a]	NE[a]	TN[a]	WA[a]
Improvement in Pain Interfering with Activity	-0.54**	-0.01	-1.80**	-0.43	-0.15	-0.11	0.24	0.37	3.01**	0.36
Improvement in Status of Surgical Wounds	-0.23	-0.94	0.12	-0.53	-0.51	-0.37	1.29**	-2.52	-0.50	0.27
OASIS-Based Process Quality Measures										
Influenza Immunization Received for Current Flu Season	2.56**	4.13**	4.30**	1.18	-4.63**	-0.15	2.66*	3.07	4.34**	5.21**
Pneumococcal Polysaccharide Vaccine Ever Received	0.11	8.98**	-2.96**	0.83	-1.88	1.51	2.07*	-0.67	6.09**	3.55
Depression Assessment Conducted	-0.08	0.59	-0.22	0.69	-0.47	-0.75	0.49	-2.49*	0.66	1.19
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care	0.41	-1.08	0.70	-0.25	-2.38**	0.71	-0.18	-0.65	1.08	2.31
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate	0.33**	1.16**	0.02	0.13	0.30	1.40*	0.58	0.09	1.34**	-0.44
Timely Initiation of Care	-0.54**	0.06	-1.09**	0.92	-0.44	0.74	-0.31	0.32	-0.30	2.62*
HHCAHPS-Based Patient Experience Measures										
How often the home health team gave care in a professional way	-0.06	0.58	-0.01	-0.02	0.57	-0.10	-0.16	-1.21	0.19	-0.28
How well did the home health team communicate with patients	-0.24	0.69	-0.37	-0.27	0.25	0.30	0.14	-1.56*	-0.42	-0.95
Did the home health team discuss medicines, pain, and home safety with patients	0.22	0.14	0.57*	0.16	0.19	0.94*	0.08	0.13	-0.62	-1.88**
How do patients rate the overall care from the home health agency	-0.16	-0.10	0.20	-0.88	0.36	0.65	-0.20	-1.41	0.27	-0.07
Would patients recommend the home health agency to friends and family	-0.30	0.75	-0.05	-0.64	-0.19	0.52	-0.75	-2.42*	-0.20	0.38

[a]*Values represent percentage point changes. * p-value <0.1 | ** p-value <0.05.*

C.11.3 State-Level D-in-D Results

Exhibit C-42. Cumulative D-in-D Results at the State-Level, Case Mix of Home Health Patients

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D	P-value	Lower 90% CI	Upper 90% CI		
HCC Score at the Start of Care						
Arizona	-0.06	0.16	-0.13	0.01	2.9	-2.1%
Florida	-0.03	0.07	-0.06	0.00	2.6	-1.1%
Iowa	0.03	0.46	-0.04	0.09	2.6	1.1%
Maryland	-0.01	0.75	-0.06	0.04	2.9	-0.3%
Massachusetts	-0.03	0.23	-0.07	0.01	2.7	-1.1%
Nebraska	0.01	0.80	-0.06	0.08	2.6	0.4%
North Carolina	0.00	0.86	-0.04	0.04	2.8	-0.2%
Tennessee	-0.07	<0.01	-0.12	-0.03	2.7	-2.8%
Washington	-0.03	0.51	-0.09	0.04	2.8	-1.0%
OASIS ADL Composite Index						
Arizona	0.13	0.06	0.02	0.24	3.0	4.2%
Florida	0.00	0.98	-0.05	0.06	3.2	0.02%
Iowa	0.05	0.60	-0.11	0.21	2.7	1.9%
Maryland	0.20	<0.01	0.09	0.30	3.2	6.1%
Massachusetts	-0.05	0.69	-0.23	0.14	2.9	-1.6%
Nebraska	-0.09	0.49	-0.29	0.12	2.7	-3.1%
North Carolina	0.10	0.09	0.00	0.19	3.1	3.1%
Tennessee	-0.18	<0.01	-0.28	-0.08	3.6	-5.0%
Washington	-0.05	0.62	-0.20	0.11	3.3	-1.4%
Percent of Episodes with Poor Overall Health Status [a]						
Arizona	5.73	0.04	1.16	10.29	31.4%	18.3%
Florida	-1.00	0.45	-3.20	1.19	35.0%	-2.9%
Iowa	2.66	0.38	-2.30	7.62	47.0%	5.7%
Maryland	-1.65	0.57	-6.37	3.07	39.6%	-4.2%
Massachusetts	-1.73	0.71	-9.43	5.96	47.6%	-3.6%
Nebraska	-7.19	0.02	-12.12	-2.26	37.6%	-19.1%
North Carolina	-0.16	0.92	-2.88	2.57	33.4%	-0.5%
Tennessee	1.68	0.44	-1.93	5.29	41.9%	4.0%
Washington	-2.86	0.27	-7.17	1.44	42.2%	-6.8%

[a] *D-in-D and 90% CI values represent percentage point changes. | CI = Confidence Interval. | These models include state-specific linear time trends. | Shading indicates significance at the p<0.05 level. | Poor overall health status was defined from OASIS M1034, Options 2 or 3.*

Exhibit C-43. Cumulative D-in-D Results at the State-Level, Home Health Utilization Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D	p-value	Lower 90% CI	Upper 90% CI		
Percent of FFS Beneficiaries with at least One HH Episode[a]						
Arizona	-0.15	0.47	-0.50	0.19	6.7%	-2.3%
Florida	-0.03	0.91	-0.43	0.37	14.7%	-0.2%
Iowa	0.24	0.09	0.01	0.47	5.6%	4.3%
Maryland	0.12	0.38	-0.10	0.35	8.7%	1.4%
Massachusetts	-0.01	1.00	-3.75	3.73	12.4%	-0.1%
Nebraska	0.11	0.55	-0.19	0.41	6.0%	1.8%
North Carolina	-0.35	0.02	-0.59	-0.10	8.6%	-4.0%
Tennessee	0.56	<0.01	0.26	0.87	9.6%	5.8%
Washington	0.10	0.53	-0.16	0.35	5.6%	1.7%
Number of HH Episodes per 1,000 FFS Beneficiaries						
Arizona	0.29	0.94	-6.30	6.87	99.7	0.3%
Florida	2.04	0.88	-19.37	23.46	277.4	0.7%
Iowa	6.85	0.01	2.67	11.04	82.1	8.3%
Maryland	3.47	0.10	0.00	6.94	125.8	2.8%
Massachusetts	0.53	0.99	-60.39	61.44	206.8	0.3%
Nebraska	2.30	0.56	-4.21	8.80	91.9	2.5%
North Carolina	-6.80	<0.01	-10.74	-2.87	135.1	-5.0%
Tennessee	27.89	<0.001	17.21	38.58	203.5	13.7%
Washington	2.52	0.32	-1.61	6.65	85.1	3.0%

[a]D-in-D and 90% CI values represent percentage point changes. |CI = Confidence Interval. | These models include state-specific linear time trends.| Shading indicates significance at the p<0.05 level.

Exhibit C-44. Cumulative D-in-D Results at the State-Level, Utilization Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
ED Use (no Hospitalization)/First FFS HH Episodes*						
Arizona	-0.12	0.82	-0.98	0.75	13.1%	-0.9%
Florida	0.47	0.02	0.14	0.80	9.9%	4.8%
Iowa	0.79	0.25	-0.35	1.93	14.0%	5.7%
Maryland	0.22	0.63	-0.53	0.96	12.0%	1.8%
Massachusetts	0.09	0.82	-0.58	0.76	12.5%	0.7%
Nebraska	0.48	0.41	-0.47	1.43	11.7%	4.1%
North Carolina	-0.01	0.97	-0.58	0.56	14.3%	-0.1%
Tennessee	-0.31	0.37	-0.87	0.25	13.0%	-2.4%
Washington	-0.68	0.36	-1.92	0.55	14.4%	-4.7%
Unplanned Acute Care Hospitalization/First FFS HH Episodes*						
Arizona	0.11	0.84	-0.77	0.99	15.8%	0.7%
Florida	-0.59	0.01	-0.97	-0.21	14.0%	-4.2%
Iowa	0.09	0.90	-1.04	1.21	17.3%	0.5%
Maryland	0.31	0.41	-0.30	0.92	18.4%	1.7%
Massachusetts	-0.56	0.29	-1.43	0.31	16.9%	-3.3%
Nebraska	-0.23	0.77	-1.52	1.06	16.9%	-1.4%

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
North Carolina	0.23	0.55	-0.40	0.85	16.7%	1.4%
Tennessee	-0.56	0.23	-1.32	0.20	17.5%	-3.2%
Washington	1.13	0.11	-0.03	2.29	15.4%	7.4%
Unplanned Acute Care Hospitalization/All FFS HH Episodes						
Arizona	-0.29	0.58	-1.15	0.56	16.9%	-1.7%
Florida	-0.87	<.001	-1.17	-0.57	15.6%	-5.6%
Iowa	-0.67	0.22	-1.58	0.23	18.3%	-3.7%
Maryland	-0.01	0.98	-0.68	0.66	20.2%	0.05%
Massachusetts	-0.31	0.52	-1.12	0.49	19.1%	-1.6%
Nebraska	-0.65	0.41	-1.95	0.64	17.3%	-3.8%
North Carolina	0.12	0.72	-0.43	0.66	18.2%	0.7%
Tennessee	-0.62	0.09	-1.21	-0.02	17.2%	-3.6%
Washington	0.98	0.09	0.02	1.95	16.0%	6.1%
Unplanned Hospital Readmission in the First 30 Days of HH Care						
Arizona	-1.01	0.14	-2.16	0.13	11.9%	-8.5%
Florida	-0.90	0.02	-1.53	-0.27	13.0%	-6.9%
Iowa	0.61	0.53	-0.99	2.21	13.2%	4.6%
Maryland	-0.22	0.68	-1.10	0.66	13.3%	-1.6%
Massachusetts	-0.22	0.72	-1.24	0.80	13.2%	-1.7%
Nebraska	-0.53	0.66	-2.49	1.43	13.7%	-3.9%
North Carolina	0.56	0.28	-0.29	1.41	12.7%	4.4%
Tennessee	-0.34	0.57	-1.33	0.65	14.6%	-2.3%
Washington	0.16	0.90	-1.84	2.15	12.0%	1.3%
ED Use Following Hospitalization (without Hospital Readmission) in the First 30 Days of HH Care						
Arizona	0.65	0.36	-0.51	1.81	10.0%	6.5%
Florida	0.60	0.07	0.05	1.16	8.4%	7.1%
Iowa	-0.66	0.51	-2.31	0.98	11.3%	-5.8%
Maryland	0.28	0.57	-0.53	1.08	9.7%	2.9%
Massachusetts	-0.42	0.53	-1.54	0.69	9.7%	-4.3%
Nebraska	0.82	0.38	-0.72	2.37	9.7%	8.5%
North Carolina	-0.09	0.84	-0.86	0.67	10.8%	-0.8%
Tennessee	-0.73	0.22	-1.71	0.24	11.0%	-6.7%
Washington	-1.63	0.15	-3.51	0.25	11.7%	-14.0%
SNF Use /All FFS HH Episodes						
Arizona	-0.11	0.73	-0.62	0.40	4.4%	-2.5%
Florida	-0.07	0.41	-0.21	0.07	4.1%	-1.7%
Iowa	-1.20	<.001	-1.79	-0.61	6.6%	-18.1%
Maryland	-0.16	0.44	-0.49	0.18	6.0%	-2.7%
Massachusetts	-0.40	0.18	-0.87	0.08	6.9%	-5.8%
Nebraska	-0.55	0.18	-1.22	0.13	6.7%	-8.2%
North Carolina	0.06	0.72	-0.22	0.35	4.6%	1.3%
Tennessee	-0.54	<0.01	-0.85	-0.22	5.0%	-10.9%
Washington	0.05	0.90	-0.58	0.67	4.9%	1.0%

*[a]Values represent percentage point changes. * Key Impact Measure | HHVBP Measures indicated by italic text. | CI = Confidence Interval. | These models include state-specific linear time trends.| Shading indicates significance at the p<0.05 level.*

Exhibit C-45. Cumulative D-in-D Results at the State-Level, Spending Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D	P-value	Lower 90% CI	Upper 90% CI		
Average Medicare Spending per Day during and following FFS HH Episodes of Care						
Arizona	$0.03	0.99	-$4.47	$4.53	$151.53	0.02%
Florida	-$1.7	0.07	-$3.26	-$0.15	$133.25	-1.3%
Iowa	-$7.47	<0.01	-$12.10	-$2.83	$132.69	-5.6%
Maryland	$6.00	<0.01	$2.82	$9.18	$172.20	3.5%
Massachusetts	-$4.96	0.05	-$9.09	-$0.82	$156.91	-3.2%
Nebraska	-$6.23	0.09	-$12.18	-$0.28	$136.46	-4.6%
North Carolina	-$0.76	0.59	-$3.04	$1.52	$130.58	-0.6%
Tennessee	-$3.28	0.03	-$5.71	-$0.86	$121.90	-2.7%
Washington	$2.82	0.36	-$2.23	$7.87	$140.88	2.0%
Average Medicare Spending per Day during FFS HH Episodes of Care						
Arizona	-$0.52	0.89	-$6.67	$5.63	$170.19	-0.3%
Florida	$0.32	0.77	-$1.50	$2.15	$145.86	0.2%
Iowa	-$11.54	<0.001	-$16.94	-$6.14	$149.76	-7.7%
Maryland	$3.24	0.22	-$1.09	$7.57	$192.61	1.7%
Massachusetts	-$5.49	0.03	-$9.52	-$1.47	$173.36	-3.2%
Nebraska	-$6.39	0.11	-$12.99	$0.22	$150.41	-4.2%
North Carolina	$0.76	0.65	-$2.02	$3.53	$143.49	0.5%
Tennessee	-$5.12	<0.01	-$8.23	-$2.01	$123.40	-4.1%
Washington	$2.43	0.44	-$2.70	$7.55	$156.53	1.6%
Average Medicare Spending per Day following FFS HH Episodes of Care						
Arizona	$3.23	0.32	-$2.10	$8.56	$112.27	2.9%
Florida	$2.27	0.21	-$0.70	$5.25	$99.64	2.3%
Iowa	-$2.38	0.55	-$8.94	$4.18	$95.27	-2.5%
Maryland	$9.42	<0.001	$4.96	$13.88	$129.11	7.3%
Massachusetts	-$3.82	0.31	-$9.99	$2.35	$116.38	-3.3%
Nebraska	-$3.10	0.58	-$12.34	$6.14	$104.14	-3.0%
North Carolina	-$2.50	0.19	-$5.64	$0.63	$99.37	-2.5%
Tennessee	-$0.19	0.94	-$4.15	$3.78	$113.92	-0.2%
Washington	$0.37	0.94	-$7.11	$7.84	$103.63	0.4%
Average Medicare Spending per day for Unplanned Acute Care Hospitalizations among all FFS Home Health Episodes						
Arizona	-$0.67	0.65	-$3.12	$1.78	$36.53	-1.8%
Florida	-$1.99	<0.001	-$2.72	-$1.26	$27.70	-7.2%
Iowa	-$4.05	0.01	-$6.78	-$1.33	$35.02	-11.6%
Maryland	$1.66	0.34	-$1.17	$4.50	$55.93	3.0%
Massachusetts	-$2.27	<0.10	-$4.53	-$0.02	$44.94	-5.1%
Nebraska	-$1.30	0.50	-$4.46	$1.85	$32.62	-4.0%
North Carolina	-$0.04	0.96	-$1.47	$1.39	$35.57	-0.1%
Tennessee	-$1.04	0.20	-$2.38	$0.30	$28.60	-3.6%
Washington	$0.63	0.75	-$2.67	$3.94	$35.42	1.8%

CI= Confidence Interval. | These models include state-specific linear time trends. | Shading indicates significance at the p<0.05 level.

Exhibit C-46. Cumulative D-in-D Results at the State-Level, OASIS Outcome Quality Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
Discharged to Community*						
Arizona	-0.64	0.39	-1.87	0.60	76.3%	-0.8%
Florida	1.36	<0.01	0.61	2.10	75.2%	1.8%
Iowa	0.08	0.93	-1.40	1.56	67.4%	0.1%
Maryland	1.05	0.21	-0.32	2.41	74.5%	1.4%
Massachusetts	0.84	0.34	-0.60	2.28	68.8%	1.2%
Nebraska	0.64	0.53	-1.02	2.30	73.1%	0.9%
North Carolina	0.08	0.89	-0.88	1.05	73.5%	0.1%
Tennessee	-2.37	<0.01	-3.55	-1.20	65.9%	-3.6%
Washington	-1.72	0.09	-3.36	-0.08	75.3%	-2.3%
Improvement in Ambulation-Locomotion*						
Arizona	3.76	<0.01	1.62	5.90	61.6%	6.1%
Florida	-2.44	0.01	-3.95	-0.92	64.8%	-3.8%
Iowa	0.09	0.95	-2.34	2.51	66.0%	0.1%
Maryland	3.36	0.02	0.96	5.76	69.0%	4.9%
Massachusetts	-1.00	0.45	-3.16	1.16	69.0%	-1.4%
Nebraska	-1.07	0.55	-4.03	1.89	64.4%	-1.7%
North Carolina	0.44	0.66	-1.20	2.08	64.9%	0.7%
Tennessee	1.93	0.09	0.08	3.79	66.2%	2.9%
Washington	1.08	0.48	-1.46	3.62	57.0%	1.9%
Improvement in Bathing						
Arizona	4.04	<0.01	1.76	6.31	67.0%	6.0%
Florida	-1.24	0.17	-2.70	0.23	73.2%	-1.7%
Iowa	-0.92	0.64	-4.16	2.31	71.4%	-1.3%
Maryland	2.98	0.08	0.21	5.74	73.7%	4.0%
Massachusetts	-1.28	0.33	-3.44	0.88	70.4%	-1.8%
Nebraska	0.76	0.62	-1.75	3.26	66.7%	1.1%
North Carolina	0.83	0.46	-1.02	2.67	67.4%	1.2%
Tennessee	1.97	0.06	0.25	3.70	69.4%	2.8%
Washington	1.73	0.45	-1.99	5.45	59.8%	2.9%
Improvement in Bed Transferring						
Arizona	3.97	0.01	1.61	6.34	58.5%	6.8%
Florida	-1.92	0.04	-3.49	-0.35	60.4%	-3.2%
Iowa	0.01	1.00	-3.23	3.24	64.5%	0.0%
Maryland	5.74	<0.01	2.41	9.06	64.6%	8.9%
Massachusetts	-0.93	0.54	-3.44	1.58	65.2%	-1.4%
Nebraska	-2.57	0.21	-5.97	0.83	60.2%	-4.3%
North Carolina	0.90	0.41	-0.90	2.71	60.3%	1.5%
Tennessee	1.54	0.20	-0.43	3.51	60.8%	2.5%
Washington	2.64	0.09	0.10	5.17	55.4%	4.8%
Improvement in Dyspnea						
Arizona	2.44	0.17	-0.51	5.38	68.7%	3.6%
Florida	-3.56	<0.01	-5.63	-1.49	64.0%	-5.6%
Iowa	-1.29	0.67	-6.28	3.70	69.1%	-1.9%
Maryland	1.76	0.33	-1.22	4.74	75.6%	2.3%

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
Massachusetts	-0.57	0.71	-3.03	1.90	69.4%	-0.8%
Nebraska	-0.82	0.68	-4.07	2.43	67.4%	-1.2%
North Carolina	-1.26	0.38	-3.62	1.09	68.7%	-1.8%
Tennessee	3.01	0.04	0.56	5.47	66.5%	4.5%
Washington	0.15	0.94	-3.29	3.60	65.1%	0.2%
Improvement in Management of Oral Medications						
Arizona	9.04	<0.001	5.45	12.63	50.2%	18.0%
Florida	2.26	<0.10	0.01	4.51	46.9%	4.8%
Iowa	0.31	0.90	-3.60	4.22	62.3%	0.5%
Maryland	5.77	0.01	2.06	9.48	59.0%	9.8%
Massachusetts	-2.77	0.15	-5.90	0.36	61.4%	-4.5%
Nebraska	-0.91	0.78	-6.25	4.43	51.3%	-1.8%
North Carolina	2.67	0.19	-0.68	6.01	49.0%	5.4%
Tennessee	2.52	0.18	-0.54	5.58	54.2%	4.7%
Washington	4.56	0.13	-0.41	9.53	42.9%	10.6%
Improvement in Pain Interfering with Activity						
Arizona	3.83	0.02	1.22	6.45	65.2%	5.9%
Florida	-0.27	0.78	-1.89	1.35	75.3%	-0.4%
Iowa	-0.74	0.75	-4.55	3.08	70.3%	-1.1%
Maryland	1.66	0.38	-1.46	4.77	70.3%	2.4%
Massachusetts	-3.54	0.01	-5.84	-1.24	71.4%	-5.0%
Nebraska	-0.95	0.59	-3.87	1.97	68.3%	-1.4%
North Carolina	0.71	0.59	-1.45	2.87	67.3%	1.1%
Tennessee	2.93	0.04	0.56	5.30	64.0%	4.6%
Washington	5.14	0.01	1.70	8.58	61.4%	8.4%
Improvement in Status of Surgical Wounds						
Arizona	1.08	0.52	-1.68	3.83	85.5%	1.3%
Florida	0.60	0.38	-0.52	1.71	91.9%	0.7%
Iowa	0.30	0.87	-2.74	3.35	86.4%	0.3%
Maryland	0.25	0.88	-2.47	2.98	90.5%	0.3%
Massachusetts	-0.74	0.50	-2.54	1.06	92.7%	-0.8%
Nebraska	5.07	0.20	-1.49	11.64	83.6%	6.1%
North Carolina	-1.28	0.20	-2.91	0.36	89.9%	-1.4%
Tennessee	2.18	0.03	0.53	3.84	88.8%	2.5%
Washington	0.73	0.76	-3.18	4.63	87.2%	0.8%

*[a]Values represent percentage point changes. * Key Impact Measure | HHVBP Measures indicated by italic text. | CI = Confidence Interval. | These models include state-specific linear time trends.| Shading indicates significance at the p<0.05 level.*

Exhibit C-47. Cumulative D-in-D Results at the State-Level, OASIS Process Quality Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
Influenza Immunization Received for Current Flu Season						
Arizona	-4.60	0.13	-9.54	0.35	64.6%	-7.1%
Florida	-1.50	0.29	-3.84	0.84	56.5%	-2.6%
Iowa	1.05	0.68	-3.20	5.31	69.3%	1.5%
Maryland	8.38	0.03	2.21	14.55	68.6%	12.2%
Massachusetts	2.64	0.40	-2.55	7.82	65.3%	4.0%
Nebraska	-4.34	0.30	-11.28	2.59	70.9%	-6.1%
North Carolina	-4.60	0.04	-8.29	-0.90	68.2%	-6.7%
Tennessee	-5.35	0.03	-9.44	-1.27	69.4%	-7.7%
Washington	-6.56	0.07	-12.55	-0.57	68.9%	-9.5%
Pneumococcal Polysaccharide Vaccine Ever Received						
Arizona	-14.94	<.001	-20.03	-9.85	70.4%	-21.2%
Florida	6.08	<.001	3.66	8.50	59.6%	10.2%
Iowa	-1.27	0.57	-4.98	2.44	79.2%	-1.6%
Maryland	2.42	0.48	-3.28	8.12	75.9%	3.2%
Massachusetts	-1.63	0.61	-6.89	3.64	66.4%	-2.4%
Nebraska	0.34	0.94	-6.92	7.60	81.1%	0.4%
North Carolina	-5.52	0.01	-8.86	-2.17	74.7%	-7.4%
Tennessee	-8.14	<0.01	-11.82	-4.46	74.0%	-11.0%
Washington	-4.53	0.15	-9.68	0.61	76.6%	-5.9%
Depression Assessment Conducted						
Arizona	2.25	0.31	-1.37	5.88	92.0%	2.4%
Florida	-0.14	0.80	-1.02	0.74	96.7%	-0.1%
Iowa	-0.33	0.82	-2.79	2.12	95.0%	-0.4%
Maryland	3.64	<0.01	1.63	5.65	97.3%	3.7%
Massachusetts	-0.23	0.88	-2.75	2.29	93.6%	-0.2%
Nebraska	2.39	0.36	-1.87	6.64	94.1%	2.5%
North Carolina	-1.43	0.13	-2.99	0.13	96.2%	-1.5%
Tennessee	-1.80	0.09	-3.55	-0.05	95.7%	-1.9%
Washington	0.82	0.60	-1.71	3.34	94.7%	0.9%
Diabetic Foot Care and Patient / Caregiver Education Implemented during All Episodes of Care						
Arizona	2.71	0.11	-0.09	5.51	93.5%	2.9%
Florida	-0.25	0.73	-1.48	0.98	92.1%	-0.3%
Iowa	-0.68	0.74	-4.00	2.65	92.0%	-0.7%
Maryland	3.06	0.12	-0.19	6.32	93.5%	3.3%
Massachusetts	2.60	0.17	-0.48	5.69	93.5%	2.8%
Nebraska	-1.10	0.65	-5.05	2.86	92.9%	-1.2%
North Carolina	0.83	0.48	-1.10	2.76	92.6%	0.9%
Tennessee	0.80	0.55	-1.38	2.97	93.5%	0.9%
Washington	-1.72	0.56	-6.53	3.10	91.9%	-1.9%
Multifactor Fall Risk Assessment Conducted for All Patients who Can Ambulate						
Arizona	-1.30	0.04	-2.33	-0.27	97.9%	-1.3%
Florida	0.12	0.59	-0.26	0.50	98.9%	0.1%
Iowa	-0.26	0.82	-2.13	1.61	97.8%	-0.3%
Maryland	-0.43	0.66	-2.05	1.18	97.4%	-0.4%

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
Massachusetts	-1.40	0.16	-3.04	0.23	96.8%	-1.4%
Nebraska	-1.04	0.12	-2.15	0.07	98.8%	-1.1%
North Carolina	-1.91	<0.01	-3.03	-0.78	97.5%	-2.0%
Tennessee	-0.22	0.78	-1.55	1.10	97.4%	-0.2%
Washington	1.54	0.03	0.36	2.72	98.3%	1.6%
Timely Initiation of Care						
Arizona	1.61	0.20	-0.46	3.68	90.1%	1.8%
Florida	1.17	0.02	0.36	1.99	94.1%	1.2%
Iowa	-2.40	0.04	-4.30	-0.50	93.3%	-2.6%
Maryland	2.49	0.11	-0.10	5.08	90.2%	2.8%
Massachusetts	-0.11	0.93	-2.15	1.93	92.6%	-0.1%
Nebraska	0.17	0.90	-2.05	2.38	92.7%	0.2%
North Carolina	1.77	<0.10	0.00	3.53	89.8%	2.0%
Tennessee	2.44	0.01	0.84	4.04	90.0%	2.7%
Washington	-0.24	0.93	-4.64	4.17	83.4%	-0.3%

[a]Values represent percentage point changes. HHVBP Measures indicated by italic text. | CI = Confidence Interval. | These models include state-specific linear time trends. | Shading indicates significance at the p<0.05 level.

Exhibit C-48. Cumulative D-in-D Results at the State-Level, HHCAHPS-Based Patient Experience Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
How often the home health team gave care in a professional way						
Arizona	-0.02	0.97	-0.75	0.72	86.7%	-0.02%
Florida	-0.23	0.26	-0.56	0.11	89.0%	-0.3%
Iowa	0.23	0.50	-0.33	0.80	88.4%	0.3%
Maryland	0.30	0.53	-0.49	1.09	87.5%	0.3%
Massachusetts	-0.78	0.07	-1.48	-0.07	88.3%	-0.9%
Nebraska	-0.42	0.33	-1.12	0.29	88.3%	-0.5%
North Carolina	0.33	0.11	-0.01	0.67	90.0%	0.4%
Tennessee	0.56	0.03	0.13	0.99	90.1%	0.6%
Washington	0.47	0.29	-0.26	1.20	86.6%	0.5%
How well did the home health team communicate with patients						
Arizona	0.03	0.95	-0.85	0.92	83.5%	0.04%
Florida	-0.42	0.08	-0.80	-0.03	85.7%	-0.5%
Iowa	-0.40	0.31	-1.04	0.25	86.6%	-0.5%
Maryland	0.76	0.16	-0.13	1.66	84.7%	0.9%
Massachusetts	-0.49	0.27	-1.21	0.24	85.4%	-0.6%
Nebraska	-0.33	0.57	-1.27	0.62	86.6%	-0.4%
North Carolina	0.01	0.97	-0.41	0.42	87.5%	0.01%
Tennessee	0.55	0.06	0.07	1.03	87.6%	0.6%
Washington	0.22	0.64	-0.55	0.99	83.9%	0.3%
Did the home health team discuss medicines, pain, and home safety with patients						
Arizona	0.26	0.64	-0.65	1.18	79.9%	0.3%
Florida	-0.52	0.05	-0.96	-0.09	81.9%	-0.6%

Measure	Model Estimates				Average in HHVBP States, Baseline (2013 – 2015)	% Relative Change
	D-in-D[a]	P-value	Lower 90% CI[a]	Upper 90% CI[a]		
Iowa	0.1	0.82	-0.65	0.85	86.1%	0.1%
Maryland	0.96	0.10	0.00	1.93	81.2%	1.2%
Massachusetts	-0.94	0.05	-1.75	-0.14	84.5%	-1.1%
Nebraska	0.84	0.17	-0.17	1.86	83.3%	1.0%
North Carolina	0.24	0.48	-0.31	0.78	84.9%	0.3%
Tennessee	0.57	0.11	-0.02	1.16	84.5%	0.7%
Washington	0.07	0.93	-1.15	1.28	80.6%	0.1%
How do patients rate the overall care from the home health agency						
Arizona	0.39	0.62	-0.91	1.69	80.5%	0.5%
Florida	-0.22	0.47	-0.73	0.28	84.5%	-0.3%
Iowa	-0.04	0.94	-0.97	0.88	85.5%	-0.05%
Maryland	0.14	0.80	-0.77	1.05	82.2%	0.2%
Massachusetts	-0.72	0.30	-1.85	0.42	84.4%	-0.9%
Nebraska	-0.17	0.85	-1.65	1.31	83.9%	-0.2%
North Carolina	0.29	0.46	-0.37	0.96	86.4%	0.3%
Tennessee	0.64	0.12	-0.03	1.31	86.2%	0.7%
Washington	0.98	0.16	-0.15	2.12	80.4%	1.2%
Would patients recommend the home health agency to friends and family						
Arizona	0.38	0.69	-1.2	1.95	75.1%	0.5%
Florida	-0.24	0.51	-0.85	0.37	79.2%	-0.3%
Iowa	1.31	<0.05	0.22	2.40	80.6%	1.6%
Maryland	0.69	0.43	-0.73	2.10	76.6%	0.9%
Massachusetts	-0.36	0.63	-1.61	0.88	81.0%	-0.4%
Nebraska	-0.36	0.73	-2.06	1.35	79.9%	-0.5%
North Carolina	0.68	0.11	-0.02	1.38	81.8%	0.8%
Tennessee	1.11	0.04	0.24	1.97	82.6%	1.3%
Washington	0.79	0.30	-0.47	2.06	76.7%	1.0%

[a]Values represent percentage point changes. HHVBP Measures indicated by italic text. | CI = Confidence Interval.| Shading indicates significance at the p<0.05 level.

C.12 Use of HHVBP Connect

C.12.1 Background

HHVBP Connect is an interactive web-based platform that allows HHAs in the nine HHVBP Model states to:

- "Find the latest updates for the HHVBP Model;
- Download valuable resources to help [agencies] succeed in the model;
- View upcoming HHVBP events and key model milestones;
- View the '2015 Benchmarks and Achievement Thresholds';
- Obtain the updated Frequently Asked Questions (FAQs);
- View past webinars and register for future webinars;
- Share best practices and chat with colleagues in the nine model states; and,
- Understand when to submit New Measures data to the HHVBP Secure Portal as well as when and how to retrieve performance reports."[57]

Launched in January 2016 and coinciding with the beginning of HHVBP Model implementation, HHVBP Connect allows the HHVBP Technical Assistance (TA) staff and HHAs in the nine intervention states to securely login to the platform and communicate with each other and share best practices for improving performance and quality among competing HHAs. The resources available on the HHVBP Connect website include newsletters, FAQs, quality improvement tools, materials regarding HHVBP performance measures, and other information pertinent to the HHVBP Model. As part of our evaluation, we assess use of the HHVBP Connect website and its resources to answer these research questions: To what extent did participants use the TA provided? How did use change across the first three performance years of the HHVBP Model?

C.12.2 Approach & Methodology

We assessed use of the HHVBP Connect site by reviewing 2018 data on monthly unique visitors, resource downloads, webinar participation, and online posts provided by the HHVBP TA contractor. We also conducted a manual count of HHVBP Connect "Chatter" activity to obtain data regarding posts and responses by HHAs versus non-HHAs. The majority of the data provided by the TA contractor did not include information that allowed for identification of individual HHAs. However, most of the data included flags for HHA user type (including HHVBP Practice Users, HHVBP Administrator, and other non-HHA user types)[58]. This information allowed us to determine that between 97.8%–100% of users (depending on the resource) represent HHAs in the HHVBP states. The 2.2% of HHVBP Connect users who do not represent HHA users include TA staff and other HHVBP contractors. Exhibit C-49 below identifies the populations used for analysis of each type of HHVBP Connect activity or resource.

[57] CMS (2016) Home Health Value-Based Purchasing Model. Accessed from here on August 20, 2019.
[58] Primarily, CMS staff and its contractors.

Exhibit C-49. Population Analyzed for Each HHVBP Connect Activity/Resource

HHVBP Connect Activity/Resource	Description of Population
Monthly Unique Visitors	All HHVBP Connect Users*
Resource Downloads	All HHVBP Connect Users*
Webinar Participation	HHAs Only
"Chatter" Activity	All HHVBP Connect Users*

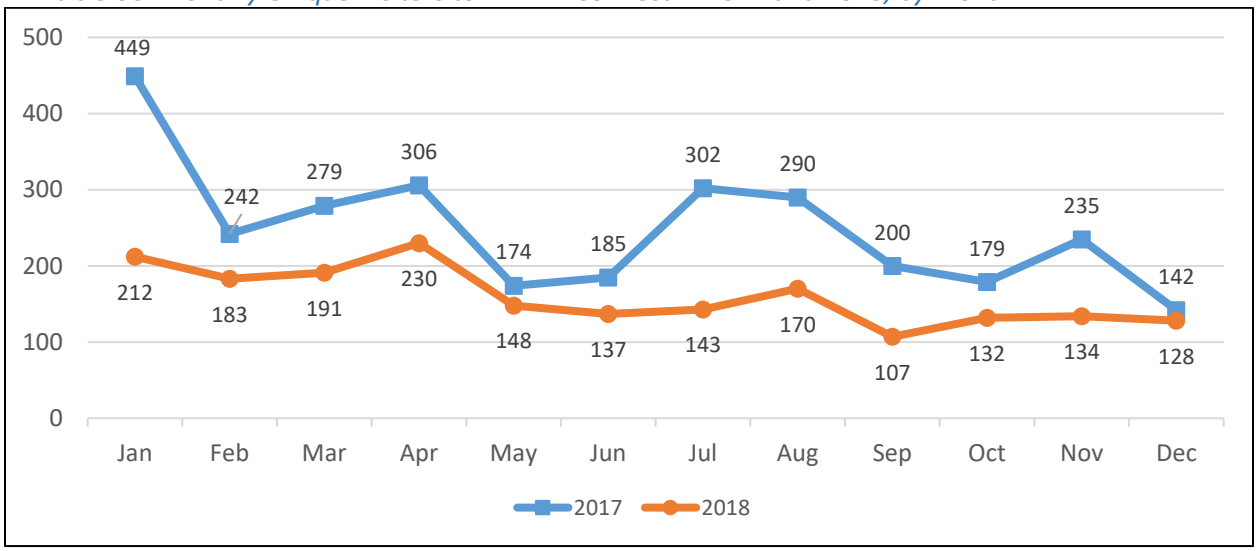
**Based on available data, approximately 97.8% of all HHVBP Connect users are HHAs (identified via the HHVBP Connect user profile name variable sent by the TA Contractor).*

C.12.3 Summary of Participation and Resource Use

C.12.3.1 Monthly Unique Visitors to HHVBP Connect

In 2017 and 2018, the HHVBP TA Contractor tracked the number of monthly unique visitors for all HHVBP Connect users via weekly dashboards. Users were required to enter a user name and password for each login to the HHVBP Connect website. In 2018, monthly unique visitors ranged between 107-230; the number of visitors in 2018 was lower for all months relative to 2017 (Exhibit C-50).

Exhibit C-50. Monthly Unique Visitors to HHVBP Connect in 2017 and 2018, by Month



Data include unique logins by all HHVBP Connect users, 97.8% of whom are HHAs. Data not available for 2016.

C.12.3.2 Use of HHVBP Connect Library Resources and Live Webinar Participation

The most frequently used HHVBP Connect resources were downloading files posted in the website's library and participation in live webinars. This was consistent with use of HHVBP Connect in prior years, although total number of downloads and webinar participation were both lower in 2018.

Download of HHVBP Connect Library Resources

To provide assistance to HHAs, the HHVBP TA Contractor made several resources available in the HHVBP Connect Library on a broad range of topics and categories. Throughout 2018, the HHVBP TA Contractor created and shared 94 different library resources that were downloaded from the HHVBP Connect website in a variety of formats, including audio webinar recordings and documents (e.g., PDFs, Excel files).

In order to understand the types of content most frequently downloaded by users in each year of the HHVBP Model, we grouped the library resources into three broad domains and counted the number of downloads corresponding to each domain (Exhibit C-51). These domains are similar to those from the first two years of the HHVBP Model, allowing for a comparison across years.

- Domain 1 encompasses regular updates on the HHVBP Model (i.e., newsletter and FAQs) as well as model guides, environmental scans, and background material about the HHVBP Model. This domain contains similar resources to those offered in the first two years of the model (2016-2017). The number of Domain 1 downloads in 2018 was less than 2017 (2,106 vs. 3,213, respectively), but similar to 2016 (2,177).
- Domain 2 includes materials to help HHAs understand and use resources and websites pertinent to the HHVBP Model, including HHVBP Connect and the HHVBP Secure Portal. As to be expected, use and availability of these resources was much higher in 2016 when the model was new, and lower in both 2017 and 2018 as HHAs became familiar with these resources (Exhibit C-52).
- Finally, Domain 3 includes materials developed by the TA Contractor to facilitate quality improvement (QI). These resources evolved slightly from an initial focus on understanding HHVBP measures and data in 2016 to providing guidance on improving on specific measures, more advanced understanding of TPS calculations, payment adjustments, and other quality improvement resources in both 2017 and 2018. Resources assisting with claims measures were the most prevalent QI resources in 2018, differing from 2017, where resources about OASIS measures were most common in this domain. This shift in resources aimed at claims-based measures may in part reflect the change to the TPS announced in July 2018 (and finalized in November) that more heavily weights these two measures.[59]

Exhibit C-51. HHVBP Connect Resource Domains and Downloads in 2018

	# of Resources	# of Total Downloads	# of Downloads per Resource
Domain 1 – Updates & Background: HHVBP Model & HHVBP Connect	**33**	**2,106**	**63.8**
Monthly Updates – Newsletters & FAQs	*21*	*1585*	*75.5*
Model Guides, Environmental Scans, & Background Information	*12*	*521*	*43.4*
Domain 2 – Introduction to and use of HHVBP Connect & HHVBP Secure Portal	**10**	**809**	**80.9**
New Measure Submission	*8*	*741*	*92.6*
Introduction/Registration, User Manual, HHVBP Connect vs Secure Portal	*2*	*68*	*34.0*
Domain 3 – Quality Improvement (QI)	**51**	**3,027**	**59.4**
Specific HHVBP Measures	*39*	*2,420*	*62.1*
OASIS Measures	13	695	53.5
Claims Measures	14	789	56.4
HHCAHPS Measures	11	925	84.1
New Measures	1	11	11.0

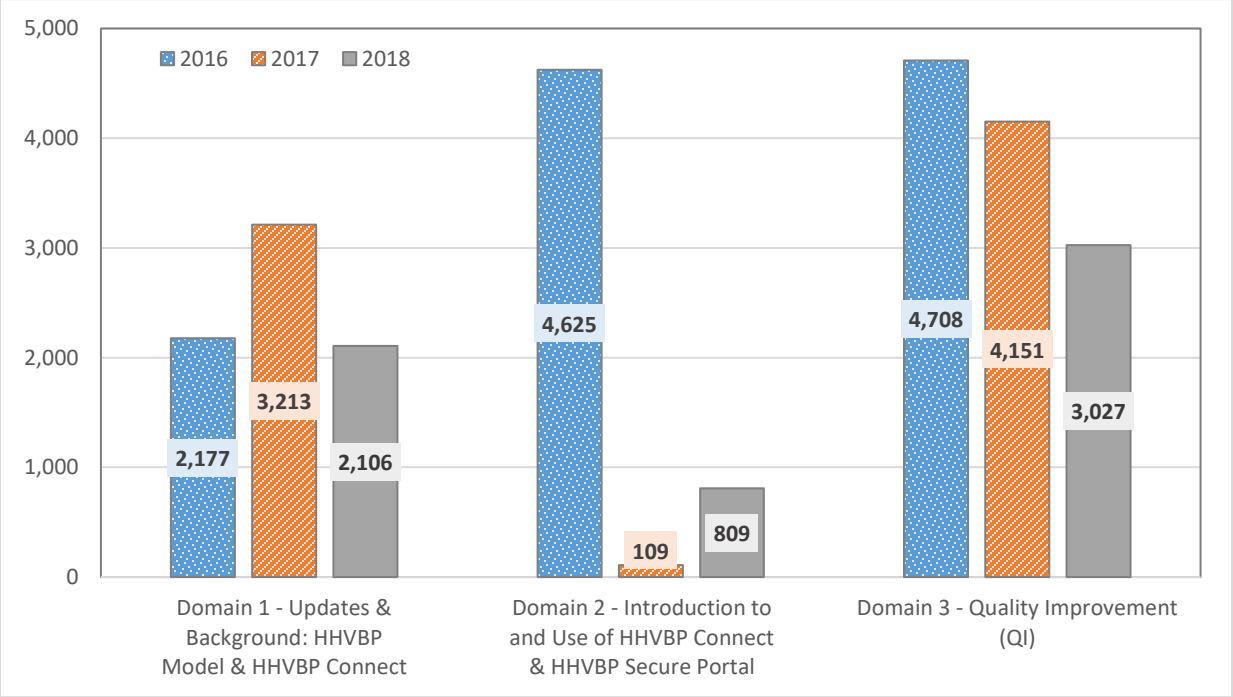
[59] See 2019 Final Rule. Accessible here.

	# of Resources	# of Total Downloads	# of Downloads per Resource
TPS Calculation & Payment Adjustments	*9*	*499*	*55.4*
Interim Performance Reports	*0*	*0*	*0.0*
Other QI Resources	*3*	*108*	*36.0*
Organizational Assessment Tools & Plans	*0*	*0*	*0.0*
Total Downloads	***94***	***5,942***	***63.2***

Data include downloads by all HHVBP Connect users, approximately 97.8% of whom are HHAs.

Similar to 2017, the majority of downloads in 2018 were for resources from Domain 1 (Updates & Background) and Domain 3 (QI) (Exhibit C-52). When comparing resource downloads across the first there years of the model, the total number decreased 21% from 2017 to 2018 (from 7,473 to 5,942) and 48% from 2016 to 2018 (from 11,510 to 5,942; not shown).

Exhibit C-52. Total Number of Resource Downloads by Domain and Description of Changes across HHVBP Model Years, 2016 – 2018



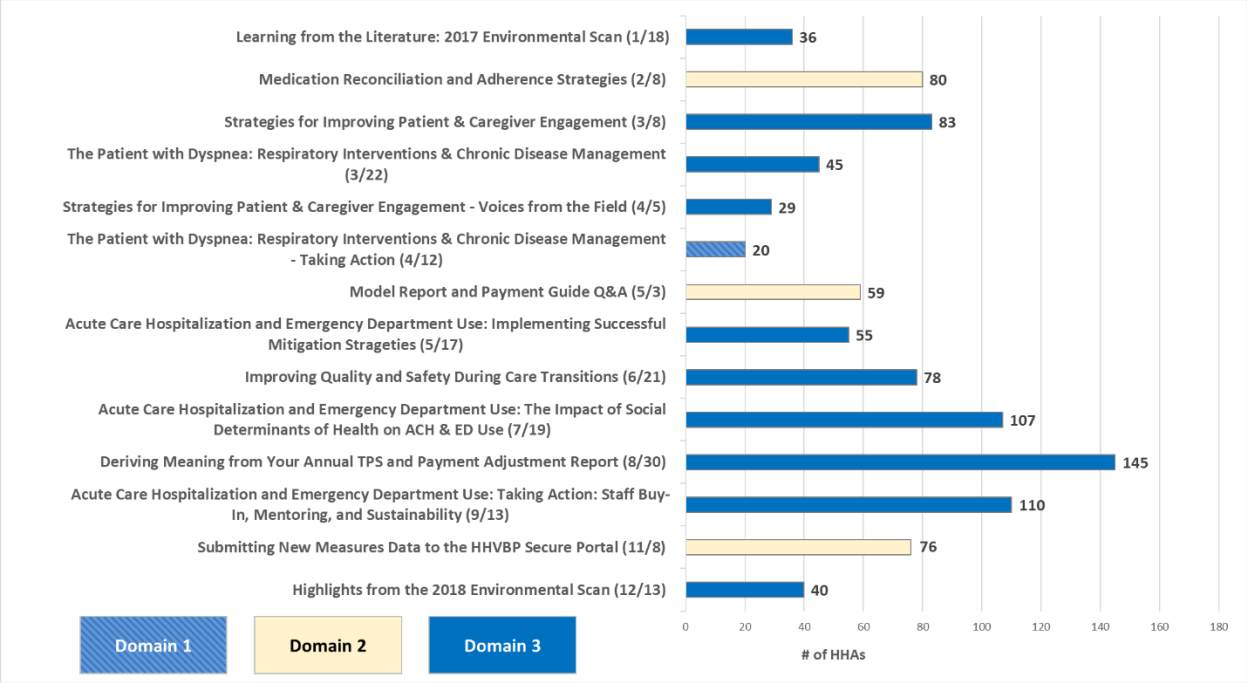
Data include downloads by all HHVBP Connect users, 97.8% of whom are HHAs.

HHVBP Connect Webinar Participation

In addition to resources available in the library, the HHVBP TA Contractor hosted 14 webinars for HHAs on HHVBP Connect throughout 2018. Exhibit C-53 showcases the webinar topics, webinar date, and attendance by HHAs, listed by date of webinar. These data refer to live attendance to the online event and reflect HHAs only (i.e., does not include non-HHA participants). The webinar topic with the highest attendance was "Deriving Meaning from Your Annual TPS and Payment Adjustment Report" in August 2018 (145 participants); this was also the highest attended webinar in 2017 (250 participants). The average number of participants per webinar was 69; this is down from 155 average attendees in 2017

and over 400 average attendees in 2016. The total number of cumulative webinar participants in 2018 was also lower than in previous years: 963 in 2018; 2,398 in 2017, and 6,408 in 2016 (not shown).

Exhibit C-53. HHVBP Connect Webinar Topics and Participation in 2018 by Domain



Data include HHAs only. Webinar participation refers to attendance during the live online event.

C.12.3.3 Participation in HHVBP Connect's "Chatter" Feature

The HHVBP Connect website's "Chatter" feature provides an interactive online community where HHAs are invited to "post status updates, share files and links with other users, 'like' posts and documents, 'follow' people and groups, and share tools, resources, and documents with other users and groups."[60]

We used a manual count to track the "Chatter" feature's use by HHAs in 2018. "Chatter" activity includes online posts and subsequent responses. Users of the "Chatter" feature include both HHAs and HHVBP TA Contractor staff, posted 93 times during 2018, with approximately 8 posts per month on average (Exhibit C-54). This is a decrease from both 2016 (31 posts per month) and 2017 (11 posts per month) (Exhibit C-54).

[60] "HHVBP Connect Website Overview" slides from February 11, 2016 Webinar.

Exhibit C-54. HHVBP Connect "Chatter" Activity by All HHVBP Connect Users in 2016, 2017, and 2018, by Month

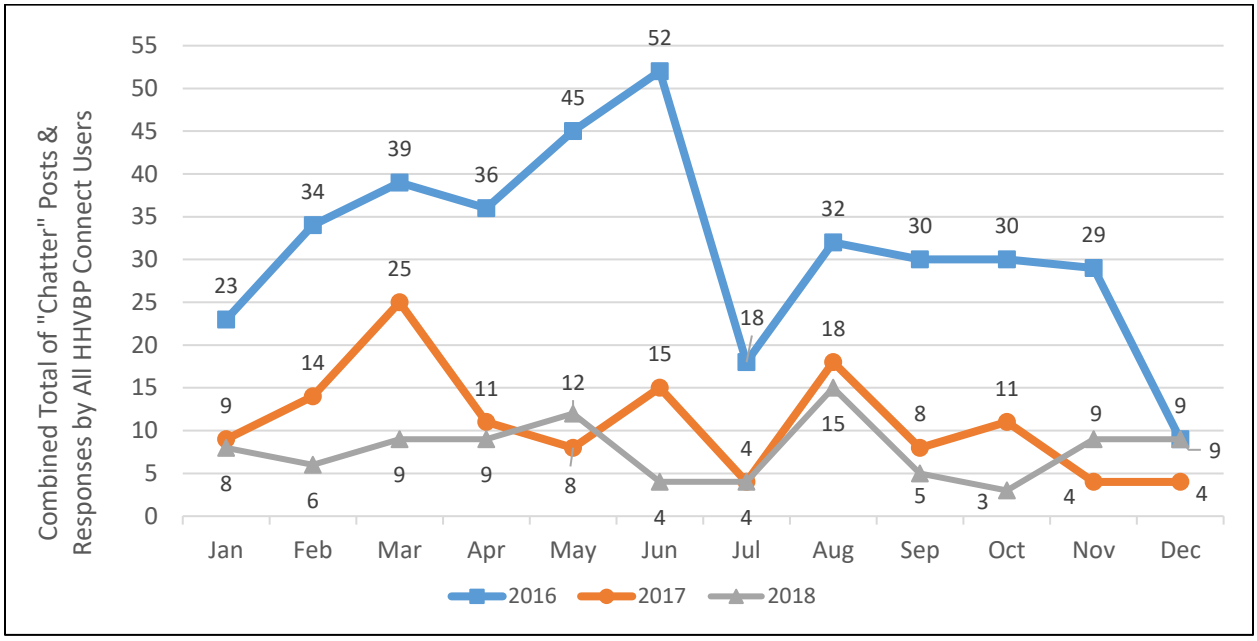


Exhibit C-55 below summarizes the "Chatter" activity between the TA Contractor and HHAs for each of the first three years of the HHVBP Model. Similar to 2017, HHVBP TA staff accounted for the majority of the "Chatter" feature activity in 2018 (72 of the 93 posts and responses). Their posts and responses were focused primarily on the promotion of upcoming online events (e.g., a webinar) or newly available resources (e.g., an updated FAQ document), and referrals to the HHVBP Help Desk. This content and number of posts by HHVBP TA staff were similar to prior years. Similar to other HHVBP Connect activities discussed above, "Chatter" activity by HHVBP TA staff and HHA users also continues to decline.

Exhibit C-55. "Chatter" Posts and Responses by TA Contractor and HHAs in 2016, 2017, and 2018

	2016	2017	2018
HHVBP TA Staff Total	**163**	**89**	**72**
Posts	*76*	*69*	*52*
Responses	*87*	*20*	*20*
HHA Users Total	**219**	**32**	**21**
Posts	*29*	*11*	*16*
Responses	*190*	*20*	*5*
Total	**382**	**121**	**93**